MODALITIES OF RECONSTRUCTION IN ORAL MALIGNANCY
A PROSPECTIVE STUDY

Dissertation submitted for

MCh DEGREE EXAMINATION

(PLASTIC AND RECONSTRUCTIVE SURGERY)

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AUGUST 2010

CERTIFICATE

This to certify that this dissertation entitled **"MODALITIES OF RECONSTRUCTION IN ORAL MALIGNANCY - A PROSPECTIVE STUDY"** is a record of the bonafide study carried out by **Dr. G. PERIYASAMY** under my guidance and supervision in the Department of Plastic Surgery, Thanjavur Medical College and Hospital, Thanjavur.

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ACKNOWLEDGEMENT

I take this opportunity to place on record my gratitude and thankfulness to all my teachers.

I thank **THE DEAN and THE MEDICAL SUPERINTENDENT**, Thanjavur Medical College and Hospital for granting me permission to conduct this study.

It's my privilege to express my deep sense of gratitude to my mentor, teacher and guide **Prof.V.DEVASENAN M.S., Mch**, who has not only inspired but also motivated, guided and helped me in completing this dissertation and has been my inspiration during my entire course.

I owe my sincere heartfelt thanks to my teachers **Prof. JOSEPH VICTOR M.S.,DNB.,Mch., Prof.R.SRIDHARAN,M.S.,Mch.,DLO.,and Prof. G. AMBUJAM M.S., FICS.,**for their encouragement and advice.

I sincerely thank my Assistant Professors **Dr. P. RAVINDRAN M.S., Mch, FICS, Dr.U.PRABHAKARAN M.S., Mch, and Dr. D.RAJKUMAR M.S.,Mch., D.ortho.,** for their support and suggestions

And finally my sincere thanks to my colleagues and my patients for their immense help and co operation without which my study would not have been completed.

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INTRODUCTION

Carcinoma oral cavity affects 10 million people annually. It is the sixth commonest carcinoma in the world. According to National cancer registry program, Thanjavur district stands at the 11th place for oral cavity carcinoma in males in India. In spite of the easy accessibility for physical examination and biopsy, majority of the patient still remain a challenge for the treating physician.

Surgery forms the mainstay of treatment and in most cases with addition of radiotherapy as an adjuvant therapy. The cosmetic, functional and psychosocial results of oral cancer may combine to produce devastating effect on the patient in view of wide range of functions of oral cavity including speech, deglutition, mastication and competence.

These patients require a well planned and well executed reconstructive strategies and extensive rehabilitative management. With the advent of the newer technique like microvascular free tissue transfer and availability of improved biomaterials like Osseointegrated implants, simultaneous reconstruction of defect and ensuring a near normal quality of life has become the standard care instead of previous concept of providing a skin coverage alone. A descriptive study of 40 patients with oral cavity malignancy and reconstructive strategies employed from October 2007 to April 2010 are discussed.

AIMS AND OBJECTIVES

- To study the demographics of oral cavity reconstruction in our department during the period October 2007- April 2010.
- To identify the various factors that influences the choice of reconstruction.
- To analyse the various methods of reconstruction and their outcomes in terms of functionality and aesthetics.

HISTORICAL REVIEW [20,39]

1000 BC	Sushruta	First mention of labial repair
1597 A.D.	Tagliacozzi	Upper and lower lip repair by distant arm flap
1768	Louis	First wedge excision and direct closure
1834	Dieffenbach	Lower lip repair with two inferiorly based cheek flaps lined with mucosa
1838	Sabbattini	Full thickness switch flap from lower lip to upper lip
1845	Dieffenbach	Nasolabial flaps for upper lip repair.
1857	Von Brums	Nasolabial flap for lower lip repair
1872	Estlander	Lateral triangular upper lip flap for lower lip reconstruction
1889	Martin	Prosthetic appliance to replace a missing segment of mandible
1895	Tansini	Superiorly based flap of skin & Latissimus dorsi muscle
1909	Lexer	Tongue donor tissue for lip reconstruction

1916	Linder Mann	Recognized the superiority of Cancellous bone
1931	Ivy	Recorder his results with immediate iliac bone grafting for mandibular defect
1954	Schuchardt	Sliding inferiorly based cheek flap that pivots around the chin prominences
1965	Bakamjian	Deltopectoral flap
1968	Hueston & mcconchie	Laterally based delto pectoral skin flap which included part of Pectoralis major
1969	Bakamjian	Delto pectoral flap for lower lip defect
1972	Leake and Rappoport	Dacron urethane prosthesis for mandibular defects
1974	Karapandzic	Emphasis on oral sphincter reconstruction
1979	Aryan	Pectoralis major myocutaneous flap
1981	Yang guofan etal	Free radial artery forearm flap

ANATOMY OF ORAL CAVITY [17]

Oral cavity encompasses the area from the Vermillion border of the lip to an imaginary line drawn between Hard and Soft Palate, and the circumvallate Papillae inferiorly. Seven Anatomical sites are included in the oral cavity.

1. Lip
2. Buccal mucosa
3. Upper & Lower alveolar ridge
4. Floor of mouth
5. Anterior 2/3 of Tongue
6. Retromolar Trigone
7. Hard Palate.

Neck nodes [5,12]

Level I	-	I A sub mental
	-	l-B submandibular
Level II	-	Extending from skull base to Carotid Bifurcation
		II A – Anterior to spinal accessory.
		II B – posterior to spinal accessory
Level III	-	Extending from Carotid Bifurcation to Omohyoid Muscle

Level IV	-	Extending from omohyoid muscle to Clavicle
Level V	-	VA Superior to the level of Cricoid cartilage VB Inferior to the level of cricoid cartilage
Level VI	-	(Pretracheal & Prelaryngeal) – central group
Level VII	-	Superior Mediastinum.
Level VIII	-	Retropharyngeal nodes of Rouviere – lymphnodes Posterior to Naso and oropharynx.

Oral cavity – Lymphatic drainage[12]

1.	Lips	Submandibular, preauricular and facial nodes
2	Buccal mucosa	Submaxillary and submental node
3.	Gingival	Submaxillary and jugulodigastric nodes
4	Retromolar trigone	Submaxillary and jugulodigastric nodes
5	Hard palate	Submaxillary and upper jugular nodes
6	Floor of mouth	Submaxillary and jugular (middle and upper) nodes
7	Anterior two thirds of the tongue	Submaxillary and upper jugular nodes

EPIDEMIOLOGY OF ORAL CAVITY CANCERS[28]

Incidence

Head and neck cancer accounts for 23 – 25% of all cancers occurring in different sites and oral cancer accounts for 50 % of these of 12.5 % of the whole body.

Age

- 90% of oral cavity cancer appears over the age of 40 years and 65 years is the average age at diagnosis.

Sex

- Male to female ratio is 2.2:1

Race (Ethnic) Origin

- Before the age of 55 years. Oral cavity – carcinoma is the 6th most common carcinoma in whites and in blacks it is the 4th most common carcinoma.
- When compared to U.S.A higher rates of oral cavity cancers are reported in India, South East Asia, Hungary and Northern France.

Second primary carcinoma[11]

- Second Primary carcinoma is defined as synchronous (Different sites within 6 months) (Or) Metachronous (Different sites after 6 months) (Or) same site after 3 years of Malignancy.
- Risk of second Carcinoma is more pronounced among patients younger than 60 years of age.

RISK FACTORS [5,18,24]

- Tobacco
- Alcohol
- Areca nut/pan masala
- Human papilloma virus
- Epstein-Barr virus
- Plummer vinson syndrome
- Poor nutrition
- In the Indian subcontinent, the use of 'pan' (a combination of betel nut, areca nut, lime and tobacco) as well as reverse smoking are responsible for high incidence of oral cavity cancers.
- These contain Aromatic hydrocarbons, Benz pyrene and Tobacco specific Nitrosamines act locally on the stem cell and interfere with DNA synthesis and leads to the formation of malignancy.

PREMALIGNANT CONDITIONS [5,32]

- ❖ High risk lesion- Erythroplakia, speckled Erythroplakia, chronic hyperplastic candidiasis
- ❖ Medium risk lesion- oral submucous fibrosis, syphilitic glossitis, sideropenic dysphagia.
- ❖ Low risk lesion- oral lichen planus, discoid lupus erythematosus, discoid keratosis congenita

Pathology [30,5]

- ❖ Squamous cell carcinoma is the most predominant type
- ❖ Adenocarcinoma and lymphoma are the other common type

HISTOLOGICAL GRADING [30]

Broders established a histological grading for squamous cell carcinoma based on microscopic evaluation of the tumor.

Cellular differentiation based on the degree of cellular pleomorphism, frequency of mitoses and extent of keratinisation.

It is classified as

a) Well differentiated (Grade – I)

b) Moderately differentiated (Grade II)

c) Poorly differentiated (Grade III)

d) Undifferentiated (Grade IV)

Some may include pattern of Invasion, stage of Invasion, presence of angiolymphatic tumour thickness, DNA content and their Serum Markers.

CHIEF SYMPTOMS [12,31,42]

- ❖ Ulcer
- ❖ Swelling
- ❖ Fetor
- ❖ Excessive salivation
- ❖ Difficulty in chewing
- ❖ Lump in neck
- ❖ Pain
- ❖ Dysphonia
- ❖ Retromolar Extension
- ❖ Ankyloglossia
- ❖ Trismus
- ❖ Bony erosion
- ❖ Dysphagia

METHODS OF SPREAD OF SQUAMOUS CELL CARCINOMA [12]

I. Local Spread

II. Lymphatic spread

III. Blood borne spread

TheTNM staging system[1]

Primary tumour (T)

Tx –Primary tumour cannot be assessed

T0- No evidence of primary tumour

Tis- Carcinoma in situ

T1-Tumour < 2 cm in greatest dimension

T2- Tumour >2 but < 4cm

T3- Tumour > 4 cm

T4 – Tumour invades adjacent structures, e.g. Mandible, skin

Regional lymph nodes (N)

Nx – regional lymph nodes cannot be assessed

N0 – No regional lymph node metastasis

N1 – Metastasis in a single ipsilateral lymph node <3 cm in greatest dimension

N2a – Metastasis in a single ipsilateral lymph node >3 cm but not more than 6cm

N2b – Metastasis in multiple ipsilateral lymph nodes, none >6cm in greatest dimension

N2c – Metastasis in bilateral or contra lateral lymph nodes, none >6 cm in greatest dimension

N3 – Metastasis in any lymph node >6cm

Distant metastasis

M0 – No evidence of distant metastasis

M1 – Evidence of distant metastasis

STAGING

Stage 0	Tis	N0	M0
Stage I	T1	N0	M0
Stage II	T2	N0	M0
Stage III	T3	N0	M0
	T1,T2,T3	N1	M0
Stage IV	T4	N0	M0
	Any T	N2	M0
	Any T	N3	M0
	Any T	Any N	M1

TREATMENT OF ORAL CAVITY CARCINOMA [15,20,26,39]

Treatment of oral cavity Carcinoma requires multimodality management.

Goals

According to the stage of tumor, the treatment protocol varies. It is roughly divided into resectable disease and unresectable disease. "Unrescetable" refers to tumors that cannot be removed without unacceptable morbidity and if it involves the vital structures like cervical, Brachial plexus, carotid artery it can be termed unresectable.

Surgery

a) Surgery of primary alone

b) Surgery of the primary with mandibulectomy

c) surgery of the primary with neck dissection

d) surgery of the primary with neck dissection & mandibulectomy

I) Lip Carcinoma

Enbloc removal of the tumor with 2cm clearance in all dimension.

II) Tongue Carcinomas

Surgical resection of the oral tongue with tumor free margin of atleast 1cm.

T1,T2,T3 No - Partial glossectomy.

Large Cancers - Extensive surgery such as total glossectomy and Reconstruction.

III) Oral cavity excluding tongue & lip

Resection of the floor of mouth, buccal mucosa, tongue and mandible can be done by any one of the four approaches.

It includes,

a) Transoral

b) Mandible sparing (Pull through)

c) Mandibulotomy

d) Composite resection.

a) Transoral

Tumors which are smaller anterior, superficial well circumscribed lesions situated in the floor of mouth, anterior 2/3 of the tongue, buccal mucosa and palate are removed through this approach.

b) Pull through procedure

It is ideal for moderate sized cancers of the anterior, lateral and floor of the mouth without involvement of the mandible. If the adequate surgical margin is not obtained it can be combined with marginal mandibulectomy.

c) Mandibulotomy

Posterior oral cavity and oropharynx are better approached by dividing the mandbile lateral to midline (i.e) Anterior to mental foramen.

d) Composite resection

Tumour invades the lateral (or) anterior arch of the mandible; it needs full thickness resection of the mandible along with tumour and neck nodes. Preserving the posterior edge of ramus of mandible, coronoid and condylar processes will help in reconstruction.

RECONSTRUCTION

PRINCIPLES OF RECONSTRUCTION[39]

- Use tissue in any repair that does not compromise or limit the ablative surgery
- Immediate reconstruction is the norm
- Reconstruction should not add to the morbidity of the ablative surgery
- Every attempt to replace “like tissue with like tissue” should be made with use of the patient’s own soft tissue and bone.
- Adapt the reconstruction to the needs of the patient.
- Should aim to restore function

LIP RECONSTRUCTION [20,21,39]

- 30% Defect- wedge excision and primary closure
- >30%- local or distant flaps

DIRECT CLOSURE AND WEDGE EXCISION

Direct closure of lip defects is possible because of the tremendous dispensability of the three elements of the lip (skin, orbicularis oris muscle, and buccal mucosa), provided the defect involves 30% or less of the lip tissue.

Direct closure must, however, be accomplished in layers after sharp debridement. Louis is credited with the first wedge excision and direct suture closure in 1768. In some instance, it may be necessary to include V-Y advancement for alignment of skin and vermilion. This method requires the simultaneous advancement of a mucosal – vermilion flap to cover lost vermilion.

FLAP RECONSTRUCTION

For lip defects greater than 30% of horizontal dimension, the use of adjacent tissue for reconstruction is mandatory.

In 1974 Johanson et al[19] described a technique that allowed reconstruction of up to two thirds of the lower lip by a "staircase" technique. Usually, two to four steps are needed to allow closure, but the disadvantage of this technique is that the scars are noticeable, and the lip may appear to be tight.

Schuchardt[39] in 1954 described a modification of the W or barrel – shaped excision, which is extended around the labial mental fold to the submental region. On occasion, a triangle – shaped excision from the submental region is necessary to correct for the advancement; again, this may result in a tight lip.

An opposing lip flap, or **Abbe**[20] flap, is used to reconstruct both upper and lower lip defects. Typically, however, it is used when defects of the upper lip, usually in the central portion, need to be reconstructed from the lower lip. An opposing flap from the lower lip is carried on its arterialized pedicle (the labial artery) to the upper lip. This flap is ideal for reconstruction in men as the lower lip provides hair- bearing tissue for continuity. For lower lip defect, the upper lip in the area lateral to the philturm is suitable for transfer to the lower lip. The central philtral area is not suitable for transfer because of its aesthetic irreplaceability.

Stein, Wexler& Dingman[39] described the excision of two upper lip flaps on either side of the philtrum that are transposed to fill a large, central lower lip defect.

The Estlander flap[39] transposition flap from the upper lip used to repair defects of the lateral lower lip. A secondary procedure is usually needed to reconstruct the obliterated commissure.

A modification of the Estlander flap is a reverse Abbe flap, which has the advantage of maintaining the commissure by transposing the flap; just medial to the commissure.

GILLIES FAN FLAP[20,14,34,39]

DESCRIPTION

The Fan Flap, originally described by Gillies in 1958, derived its name from its resemblance to the rotational opening of a handheld fan. The flap is full-thickness including mucosa and is based on the opposing lip's labial artery. In designing the flap, the opposing lips's white line is marked at a point away from the lateral aspect of the defect along the vermilion equal in length to the width of the defect. This mark represents the area on the opposing lip that will become the new commissure after flap inset. Extending out from this mark, along a radiant RSTL, a full-thickness incision is made approximately 1.5cm in length. The incision is then turned

acutely at an angle of approximately 60 degrees to the outer part of the nasolabial fold. The incision then follows the fold and turns acutely toward the defect to match the height and width of the flap to the height and width of the defect. To facilitate flap transfer, an opposing 60 degrees angled incision from the nasolabial fold is made into the cheek, creating a Z-plasty at the base of the flap.

Indication

Full thickness upper and lower lip defect

ADVANTAGES

The fan flap provides actual lip tissue for replacement of the lost segment of lip.

DISADVANTAGES

- Microstomia
- Non sensate flap

Karapandzic modified[22] the Gillies fan flap in an attempt to leave the neurovascular supply intact. Tissue from the nasolabial fold, including the lower fold, is rotated medially and provides the proper muscle orientation. This flap can be designed as a unilateral or bilateral flap. Disadvantage, microstomia, often requires a secondary commissuroplasty.

Mcgregor flap

Mcgregor modified the Estlander flap with the inclusion of vermilionectomy and it differs from the Gillies fan flap by the method of transfer. It pivots around the Commissure, transposing the cut edge upward. Thus the angle of Commissure reminds in passion, but the transfer leaves the lip devoid of vermilion along its free border.

Nakajima flap

Modification of Mcgregor flap which includes the neuro vascular supply intact.

COMPARISON OF FAN FLAPS

Flap	Commissure distortion	Vermilion loss	Sensation	Angle	Microstomia
Gillies	+	-	-	60°	Moderate
Mcgregor	-	+	-	90°	Minimal
Karapandzic	+	-	+	-	More
Nakajima	-	+	+	90°	Minimal

COMMISSURE RECONSTRUCTION [20,39]

In reconstructing the vermilion at the Commissure, one must remember the principles that the upper lip, cosmetically, is more important and that sharing of the vermilion of the lower lip gives the most pleasing results.

One determines the most lateral aspect of the neocommissure, which usually lies at an imaginary vertical line dropped from the midportion of the pupil. Careful measurement and knowledge of the “normal” are most important so that reconstruction of the commissure is placed symmetrically to the opposite normal commissure.

Commissure flap design, measurements of the normal from the height of the Cupid’s bow on the nonaffected sided to the commissure. The defect measurement is transposed along the vermilion mucosa to the lower lip on the affected sided. Elevation of vermilion mucosal flap and incision of cicatricial commissure. Insertion of upper lip commissuroplasty flap with advancement of lower lip mucosa for closure of donor site.

RECONSTRUCTION OF TOTAL UPPER AND LOWER LIP DEFECTS [20,39]

For massive deformities of the lower lip, bilateral lower lip and cheek advancements can be accomplished as described by Bernard. Webster et al added several technical refinements to the procedure in 1960. In their modification, a tumour is excised as a quadrilateral segment.

The Webster modification allows the design of a sensate, aesthetic, and functional reconstructive result with a competent and innervated oral stoma.

For reconstruction of an entire mouth, it is wise to plan not only flap coverage but also camouflage. In this vein, a temporal frontal scalp flap can be used.

For reconstruction of the upper lip, a delayed temporal frontal scalp flap based on the anterior branch of the superficial temporal artery can be elevated and lined with a split- thickness skin graft.

TONGUE RECONSTRUCTION [15,20,21,39]

Oral function is determined ultimately by tongue function. The extent of resection dictates functional outcome in non – reconstructed patients after partial glossectomy. Resections that preserve innervation to the residual tongue and tongue mobility will result in the best function postoperatively. If sensibility is preserved primary closure of the defect may optimize functional outcome as long as there is no tethering. Defects that involve <10% to20% can be closed primarily with out any significant difficulty in speech and swallowing. If primary closure distorts the anatomy or results in significant tension at the suture line, a different reconstructive option should be chosen.

If 30% or more of the native tongue remains after resection, a thin, pliable flap such as the radial forearm is desirable to preserve tongue mobility without adding excessive bulk. Preservation of even a small tongue

remnant may improve swallowing and speech as long as the remaining portion of the tongue is able to contact the palate.

Reconstruction after total or near total glossectomy requires replacement of a large tissue volume and elimination of dead space. The reconstruction must provide bulk, so that the neotongue can act as an obturator to prevent aspiration. The rectus abdominis musculocutaneous flap is often a good choice for this defect. In heavy patients, the rectus flap may provide too much bulk. In this situation, the surgeon can excised the skin paddle and use muscle and fascia alone to close the defect.

The exposed intraoral flap may then be skin grafted or, alternatively, allowed to remucosalize spontaneously. Reconstructed glossectomy patients must learn mechanisms to position the neotongue for optimal speech and swallowing.

FLOOR OF THE MOUTH [21,39]

Small nonirradiated defects may be allowed to heal secondarily or may be resurfaced with skin grafts, even when periosteum or bone is exposed. In cases of previous or planned radiation, for large defects, or when a significant amount of bone is exposed, flap closure is preferable. The flap must be thin and supple.

The free radial forearm is the flap of choice because of its characteristics, reliability, and low donor site morbidity. When anterior segmental mandibulectomy is performed during resection of a floor of mouth tumor, an osteocutaneous flap is required for reconstruction. In most cases, the flap of choice is the free fibula

During reconstruction, an effort should be made to maintain the lingual vestibule, and sufficient height should be restored to the floor of mouth so that saliva and food particles do not pool there. For this reason, when a floor of mouth resection includes resection of the mylohyoid complex, the defect is best managed by the use of a flap because a skin graft will produce a significant depression under the tongue.

BUCCAL MUCOSA [15,21]

The buccal mucosa is specialized to provide extensibility of the cheek tissues during mandibular excursion. Inadequate replacement of buccal tissue may interfere with mouth opening and denture wear. Small superficial defects can be closed primarily or allowed to heal by secondary intention. Larger defects may be amenable to closure with skin or mucosal grafts or mucosal rotation flaps, but these techniques are limited by tissue loss and wound contraction.

When necessary, thin pliable flaps, such as the platysma flap or radial forearm free flap, are used to replace missing mucosa. Through and through defects of the cheek may require two flaps (a lining flap plus an external flap), a folded or double – paddle flap, or a flap and graft.

LOWER AND UPPER ALVEOLAR RIDGE RECONSTRUCTION[15,20,21]

Tumours of the lower gingiva frequently involve bone and require at least partial mandibular resection. When marginal mandibulectomy is performed for a small cancer, there may be adequate mucosa remaining for direct closure over the bone.

After extensive marginal mandibulectomy, reinforcement of the remaining mandibular rim with a low – profile reconstruction plate is recommended, especially when postoperative radiotherapy is planned.

A radial forearm free flap is often a good choice. In contrast, an osteocutaneous flap is the preferred reconstruction if segmental mandibulectomy is required.

Small, superficial cancers of the maxillary alveolar ridge can be excised and left to heal by secondary intention. Larger cancers may require alveolectomy or maxillectomy,

PALATE RECONSTRUCTION [20,39]

The plate divides the upper airway into oral and nasal parts, allows intelligible speech, and aids in deglutition. Defects resulting from resection of small superficial lesions of the hard palate or upper alveolus may be skin grafted or left open to heal secondarily. Bone involvement by tumour may require alveolectomy or partial or total maxillectomy. With resection of palatal bone, a palatal obturator is required.

Alternatively, an osteocutaneous flap can be used to reconstruct the hard palate or to provide a platform for Osseo integrated implants. The soft palate is often secondarily involved with tumour by direct extension of an oral cavity cancer. Large soft palate defects are, in general, best rehabilitated prosthetically.

RETROMOLAR TRIGONE RECONSTRUCTION [20,39]

Small retromolar trigone lesions are treated by excision, often accompanied by marginal mandibulectomy of the ascending ramus to obtain clear margins. Primary closure or skin grafting may be adequate.

The best reconstruction for a posterior mandibular defect is controversial, but there is some consensus that bony reconstruction of the mandible is not required. If the bony resection involves only the ramus and

part of the body on one side, a reasonably good reconstruction can be achieved with a soft tissue flap, such as a recuts abdominis free flap.

In contrast, resection of the anterior arch of the mandible results in significant functional deficit and major aesthetic deformity. If the mandibular defect extends anteriorly beyond the symphysis, bony reconstruction is required.

SPECIFIC SURGICAL TECHNIQUES

Primary Closure and Secondary Healing

Skin Grafts

Split – thickness skin grafts can be used to close superficial defects of the alveolus, the palate, or the dorsum or lateral edge of the tongue. Immobilization of intraoral grafts remains challenging. Special splints can be fabricated and sutured in place, or multiple quilting sutures can be placed to hold the graft in position.

LOCAL AND REGIONAL FLAPS [6,13,14,15,16,27,33,39,40]

A litany of local and regional flaps has been used for oral cavity reconstruction. Tongue flaps were frequently used to close small oral defects in the past but have fallen into disfavour because of the tethering and functional disturbance that result. Nasolabial, and temporalis muscle flaps,

once used extensively, are rarely indicated now that free tissue transplantation is available. The facial artery musculomucosal flap has proved useful for small defects of the hard palate, alveolus, tonsillar fossa, and floor of mouth but has found limited application.

DELTOPECTORAL FLAP

- Bakamjian flap
- Skin flap
- Used to cover – middle and lower third of face, intra oral cavity and neck
- Based on 1st ,2nd .3rd and 4th perforating branches of internal mammary artery

Size of the vessel: length 1-2 cm ;

Diameter 1-2mm

- Location with in 3 to 4 cm of the midsternal line
- Thoraco acromial axis supplies the deltoid zone

Flap dimension: 10x20 cm for standard flap

10x27 cm for delayed flap

Flap design:

- upper portion : infra clavicular region
- Medial base: parasternally3 or 4 upper intercostals space

- ❖ Distal end: anterolateral, midlateral or posterolateral contour line of the deltoid region

Pivot point:

upper medial corner of the base – due to better stretching ability of the skin over the anterior axillary fold to allow full abduction and elevation of arm.

Advantage :

- ❖ Straightforward design
- ❖ Ease of dissection

Disadvantage:

- ❖ Poor reliability without surgical delay
- ❖ Unsightly donor defect

STANDARD FOREHEAD FLAP

- ❖ Mcgregor flap
- ❖ Skin flap

- ❖ Used to cover middle and inferior third of face, oral cavity, lateral face and frontal and maxillary sinus
- ❖ Based on superficial temporal artery and minor pedicle from supra trochlear and supra orbital artery
- ❖ Size: 22x7 cm

❖ Design: Entire forehead skin is included in the territory of the flap.

Advantages:

- ❖ Folded forehead flap can be used for both lining and cover,
- ❖ Constant vascular supply.

Disadvantages:

- ❖ Unsightly donor area.

NARAYANAN FLAP

Based on the posterior branch of superficial temporal artery .

Bilobar and Trilobar flap designs used to cover massive defects of the cheeks.

MUSCULOCUTANEOUS FLAPS [6,13,14,15,16,39,40]

Several musculocutaneous flaps have been described for head and neck reconstruction.

PECTORALIS MAJOR FLAP

First described for head and neck reconstruction by Ariyan in 1979 workhorse of head and neck reconstruction. It is best used to reconstruct defects requiring tissue bulk, such as total glossectomy and composite posterior mandible defects.

Anatomy

The pectoralis major muscle is a large, fan – shaped muscle arising from the medial half of the clavicle, the sternum, and the upper seven costal cartilages. It inserts into the crest of the greater tubercle of the humerus and acts as a medial rotator and adductor of the humerus. It is innervated by the lateral and medial pectoral nerves.

The muscle receives its primary blood supply from the thoracoacromial artery and a secondary blood supply from segmental parasternal perforators arising medially from the internal mammary artery.

Flap Design

The thoracoacromial vessels join the subclavian vessels at about the middle third of the clavicle. They turn to travel along an axis drawn from the shoulder to the xiphoid process, running inferomedially on the deep surface of the pectoralis major muscle. A skin paddle is outlined along the vascular axis.

Advantages and disadvantages

The advantages of the pectoralis major flap are its straightforward design, ease of dissection, and relative reliability. The flap can be dissected with the patient supine, and microsurgical expertise is not required.

Disadvantages include limited arc of rotation and bulkiness, which tends to resolve with time if the nerves to the transplanted muscle are severed. Flap elevation is difficult in pendulous breast.

TRAPEZIUS FLAP

- Lower trapezius myocutaneous flap published by Back et al and Mathes & Nahai in 1980.
- According to Mathes & Nahai – Type II muscle.
- Trapezius muscle is the most superficial muscle on the posterior aspect of the Neck & thorax.
- It has three parts – Descending or superior part.

  Transverse or middle part

  Ascending or inferior part.
- Only the middle and ascending part are widely used in reconstructive surgery.
- Middle part based on superficial cervical artery – superficial branch of the transverse cervical artery.

  Length – 4.7 cm

  Diameter – 4mm

- Ascending part is based on Dorsal scapular artery – deep branch of Transverse cervical artery.

Length – 5.83 cm

Diameter – 3.3 mm

- Trapezius supplied by spinal accessory nerve.
- Size : 14 x 6 cm for SCA

  Bone segment – 10 x 2cm

- Used to reconstruct Floor of mouth, mandible, Hypopharynx, oesophagus and Neck defect.

Advantage :

- Provides a fast and Easy procedure to reconstruct the defect of Floor of the mouth and the mandible.
- Island flap is thin and pliable
- A free flap based on DSA can be dissected with a very long pedicle.

Disadvantage:

- Risk of Accessory nerve damage is high
- The bone segment should not exceed 10 x 2 cm to ensure vascularisation which limits the indications to smaller Bone defect.

FREE FLAPS[6,13,1415,16,27,39]

RADIAL FORE ARM FLAP:

- Yang guo fan etal., described this free Radial Fore arm flap.
- Chinese flap.
- Fascio cutaneous type C Flap.
- Used to cover – Fore arm, Elbow, Wrist, Hand, Thumb, Head and Neck.
- Based on Radial artery and veins – Cephalic vein and venaecomitantes of Radial artery.
- Length – 20 cm
- Diameter – 2.5 mm

MINOR PEDICLE

- Musculocutaneous branches from Radial recurrent artery and Vein.
- Inferior Cubital artery.

PEDICLE LOCATION:

A line drawn from the centre of the antecubital fossa to the radial border of the wrist where the radial pulse is palpable represents the course of the radial artery. Line becomes the central axis for the design of the skin flaps.

LAND MARK:

Crease in the antecubital Fossa, the distal wrist crease and the ulnar and radial borders of the fore arm.

SIZE:

Flap of any size or shape at any point between antecubital fossa and wrist.

Allen's Test:

Allen's test should be done to check the patency of both ulnar and Radial artery.

Advantages:

- ❖ Thin supple flap most suitable for Intraoral reconstruction.
- ❖ Often allows two team approaches.
- ❖ Forearm has a relatively constant and reproducible Vascular Anatomy based on large vessels.

Disadvantages:

- ❖ Major Artery is sacrificed.
- ❖ Unsightly donor defect.
- ❖ Risk of fracture if Radius is harvested

ANTERO LATERAL THIGH FLAP

- In 1984, Song et al., introduced the anterolateral thigh flap
- Based on septocutaneous branches of the descending branch of the lateral circumflex femoral artery.

  Length – 12 cm

  Diameter – 2.1 mm

- More recent studies and series indicate the skin vessels are predominantly musculocutaneous perforators and less commonly septo cutaneous perforator.
- Venous drainage is by venae comitantes of the lateral circumflex femoral vessel.
- Innervation ia by lateral femoral cutaneous nerve.

Marking:

- A line is drawn from the anterior superior iliac spine to the lateral aspect of the patella. A circle is drawn with the centre of the circle at the mid point of the line. Most of the skin vessels are found in the distal posterior quadrant of the circle.

Flap Components

- Cutaneous flap
- Composite flap – Muscle and Fascial Component

- ❖ Chimeric flap is possible.

Dimension

Skin Island

- ❖ Length - 16 cm (4-35 cm)
- ❖ Width – 8 cm (4-25 cm)

Muscle:

- ❖ Length - from 2 cm (Cuff) to 20 cm (Entire Muscle)

Advantage:

- ❖ Ease of harvest with relatively constant anatomy.
- ❖ Long length and large pedicle.
- ❖ Ability to provide sensory innervation

Disadvantage:

- ❖ Color Mismatch and bulk
- ❖ Presence of hair

MANDIBLE RECONSTRUCTION[15,20,21,39,43]

Classification

HCL system (Jewer etal)

L- Lateral Defects (condyle not included)

H- Hemi mandible segment (condyle included)

C- Between the two canine teeth

Methods

I Non vascularised Methods

a) Non vascularised bone grafts

b) Prosthetic plates

II Regional Osteocutaneous Flaps

III Free flaps

I Non vascularised bone grafts

- Relies on soft tissue bed & adjacent mandible ends for revascularisation
- Long term stability by creeping substitution

Unfavourable condition

- Previous irradiation
- Extensive scaring
- Infection
- Previous surgery /trauma
- Lack of soft tissue cover.

Indications

a) small defects (<3cm) including ramus or body of mandible

b) bone only defects

c) defects due to benign tumours

d) mandible fracture non-union

It includes use of autogenous bone and fixation to native mandible.

Prerequisites:

1. bone transplantation into healthy tissues
2. recipient area with adequate blood supply
3. wide contact between adjacent bone and graft
4. positive fixations

Methods of Fixation:

Intra oral fixation

1. Teeth present on both sides - lateral defect-Mono maxillary splint with or without IMF

   - ❖ central defect - each lateral segment with splint and IMF

2. Loose Ramus fragment (no teeth in posterior fragment)

   - ❖ Post fragment displaces forwards and medially
   - ❖ Sub periosteal detachment of masseter and medial pterygoid

- ❖ Wedging of graft between anterior and posterior segment

3. Edentulous Mandible Maxillary Dentition Present

   Bite block for mandible maintained by circumferential wiring

   IMF of bite block to maxillary teeth.

4. Edentulous Maxilla

   Bite Block to maxilla maintained by circum zygomatic wiring

   IMF if mandible teeth present if not to bite block maintained by circumferential wiring

MINIPLATE FIXATION OR INTERNAL SPLINTING

EXTERNAL FIXATION

Techniques

a. as much cancellous bone must be included
b. cortical bone is required to provided strength
c. periosteum to help in revascularisation

Donor sites

1. corticocancellous bone grafts from illiac crest

2. Split rib grafts.

Small and medium sized defects

Narrow defect → cancellous bone graft

Larger defect → solid piece of bone to overlap the edges held in place by miniplates or interosseous wiring, interstices filled with bone chips

Major portion or entire body defects

1. Three large iliac bone grafts wired to each other.
2. Lengths of rib notched on the inner aspect and bent
3. Internal splint with bone chips
4. Two symmetric rib grafts

Hemi mandible

- ❖ Meniscus of TM joint should be preserved
- ❖ Full thickness iliac bone graft from the same side

Prosthetic plates & coverage with regional flaps

Indication → Lateral or posterior defects in pts who are not candidates for vascularised mandible reconstruction

Options

1. AO plates (>2.5mm) (3-4 screws on each side)
2. Thorp (titanium hollow screw reconstructive plates)
3. Titanium locking plates

Techniques

- ❖ plate should be shaped against the native mandible before resection
- ❖ plate should be aligned along the lower border
- ❖ In secondary reconstructions a template is used for plate fashioning
- ❖ In absence of soft tissue coverage, it should be covered by a flap (free or pedicled flap)

Regional osteo myocutaneous flaps

Advantages

- ❖ Single stage transfer
- ❖ Improved vascularity of bone
- ❖ Contiguous donor site
- ❖ Less operative time

Disadvantages

- ❖ Limited amount of bone availability
- ❖ Poor vascularity of bone
- ❖ Limited flexibility in insetting

Free flaps.

- ❖ Gold standard

Donor site

- ❖ Ilium
- ❖ Radius
- ❖ Scapula
- ❖ Fibula

FREE FLAP DONOR SITE COMPARISON FOR MANDIBLE RECONSTRUCTION*

S.No	Vascular Pedicel	Bone	Skin	Location	Morbidity
Iliac	Deer circumflex Iliac Artery D	B (16cm)	D	B	C
Radius	Radial artery A	D (10cm)	A	C	D
Scapula	Circumflex scapular Artery C	C (10-14cm)	B	D	B
Fibula	Peroneal Artery B	A (25 Cm)	C	A	A

* Ranked in each category from best (A) to worst (D)

NECK DISSECTION [2,3,7,8]

Neck dissections are classified as follows

In 1991	In 2001
1. Radical Neck dissection	1. Radical Neck dissection
2. Modified Radical neck dissection	2. Modified Radical neck dissection.
3. Selective Neck dissection	3. Selective neck dissection
a. Supraomohyoid	a. SND (I-III/IV)
b. Lateral	b. SND (II-IV)
c. Posterolateral	c. SND (II-V, Post auricular Sub occipital)
d. Anterior	d. SND (Level VI)
4. Extended Neck dissection	4. Extended Neck dissection

Various incisions are being used for neck dissection (a) Latyschevsky (b) Freund (c) Crile (d) martin (e) Babcock and conley.

RADIO THERAPY [5,10]

Main stay of treatment for cancer in the head and neck region.

Choice of therapy

a) External Beam Therapy
b) Brachy Therapy
c) Intra Operative Radiation Therapy

CHEMOTHERAPY [4,5]

Introduction of more active chemotherapeutic agents and combinations being increasingly used in complex multimodal treatment plans along with surgery and Radiotherapy.

General Strategies

1. Induction is given before surgery or radiation (Neoadjuvant chemotherapy)
2. Concomitant chemoradiation – chemotherapy is given simultaneously with radiation.
3. Adjuvant therapy where chemotherapy is given after surgery (or) radiotherapy in an effort to reduce metastatic burden.
4. Cisplatin and 5 FU are the drugs of choice.

FOLLOWUP [39,40]

American Head and Neck society guidelines for cancer surveillance.

Years Post Rx	Follow-up
1st year	1 – 3 M
2nd year	2 – 4 M
3rd year	3 – 6 M
4th & 5th year	4 – 6 M
After 5th year	Every 12 M

MATERIALS AND METHODS

- This study is the prospective non randomized descriptive study conducted in the Department of Plastic Surgery, Thanjavur medical college and hospital.
- A total of 40 Patients with oral malignancy who were treated in our department from October 2007 to April 2010 were included in the study.
- Detailed History, Physical Examination & appropriate investigations were done to arrive at a clinical diagnosis.
- Patients with prior histopathological diagnosis were included in the study. Co morbid conditions were thoroughly assessed.
- Patients were clinically staged with the help of clinical examinations and staging investigations.
- Based on the clinical stage of the disease, treatment and reconstruction was planned for each case in our departmental planning session.

TREATMENT PROTOCOL

Workup:

- Histopathology
- Chest X-Ray
- OPG
- Technitium 99^{m} scan
- USG Abdomen
- FNAC of lymph node
- Anesthetic evaluation
- Dental evaluation

Stage I - Radical Excision with reconstruction.

Stage II - Radical Excision with reconstruction.

Stage III - Radical Excision with Neck dissection with Reconstruction

Stage IV - Composite resection with neck dissection with Reconstruction

- ❖ Reconstruction option were planned and executed on a case by case basis.
- ❖ All patients underwent primary reconstruction.
- ❖ Immediate postop complications were identified and treated.

FOLLOW UP

Patients were observed regarding local recurrences, nodal recurrences, aesthetic and functional outcomes.

INCLUSION CRITERIA

All patients diagnosed with oral malignancy during the study period.

EXCLUSION CRITERIA:

Patients with metastasis

Lesions involving retromolar trigone

Recurrent malignancy

Patients with N3 nodal status were excluded in the study.

OBSERVATION AND RESULTS

INCIDENCE OF ORAL CANCER IN THANJAVUR MEDICAL COLLEGE HOSPITAL

YEAR	TOTAL CASES OF MALIGNANCY	TOTAL CASES OF ORAL CANCER	% OF ORAL CANCERS
JUNE – DEC 2007	709	96	13.5 %
2008	1641	211	12.8 %
2009	1130	120	10.6 %
	3480	**427**	**12.2 %**

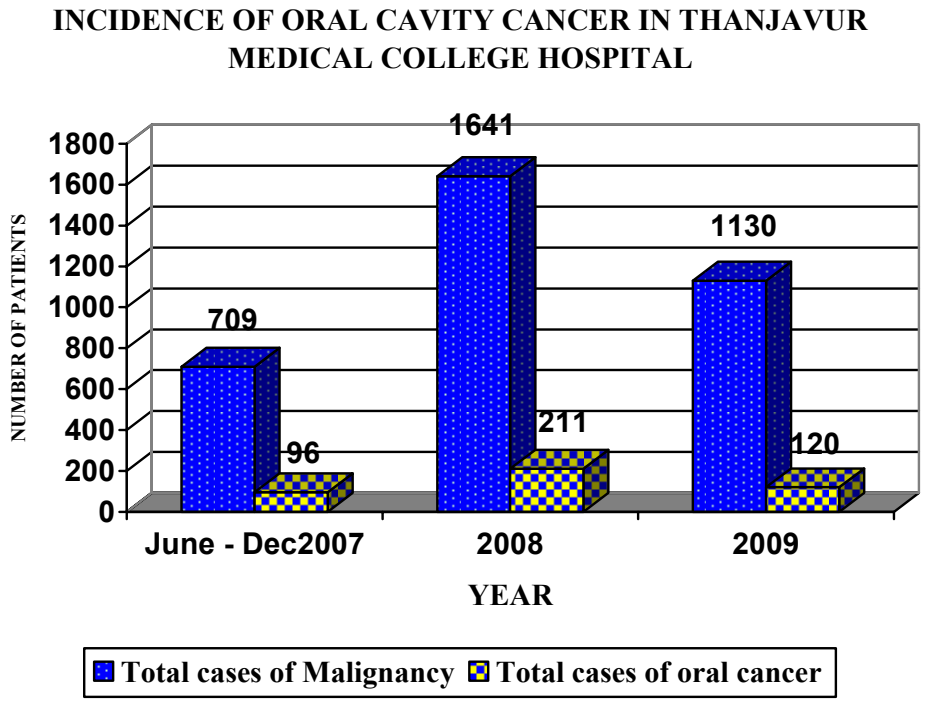


Fig.1 – Oral Cavity Cancers constitute 12.2 % of the total malignancy reported in Thanjavur Medical College Hospital

INCIDENCE OF ORAL CANCER ACCORDING TO ANATOMICAL AREA

SI.No	CANCER SITE	TOTAL NO. OF CASES	%
1.	Cheek	26	65
2.	Lips	13	32.5
3.	Alveolus	1	2.5

INCIDENCE OF ORAL CAVITY CANCER ACCORDING TO ANATOMICAL AREA

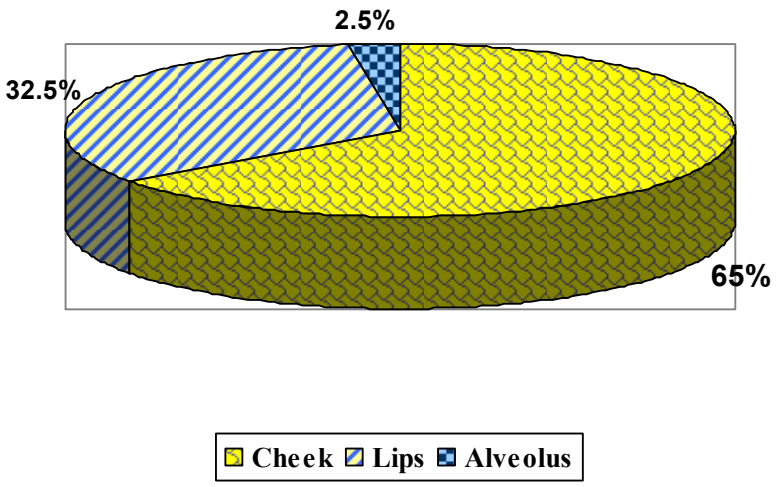


Fig.2 – Cheek was the most common site of oral Malignancy which accounts for 65% and Lip was the next Common site 32.5%

DISTRIBUTION OF PATIENTS IN VARIOUS AGE AND SEX GROUPS

AGE (year)	MALE		FEMALE		TOTAL	
	No.	%	No.	%	No.	%
20 – 30	2	6.6	0	0	2	5
31 – 40	4	13.3	1	10	5	12.5
41 – 50	8	26.6	2	20	10	25
51 – 60	8	26.6	3	30	11	27.5
61 – 70	5	16.6	2	20	7	17.5
> 70	3	10	2	20	5	12.5
	30		10		40	

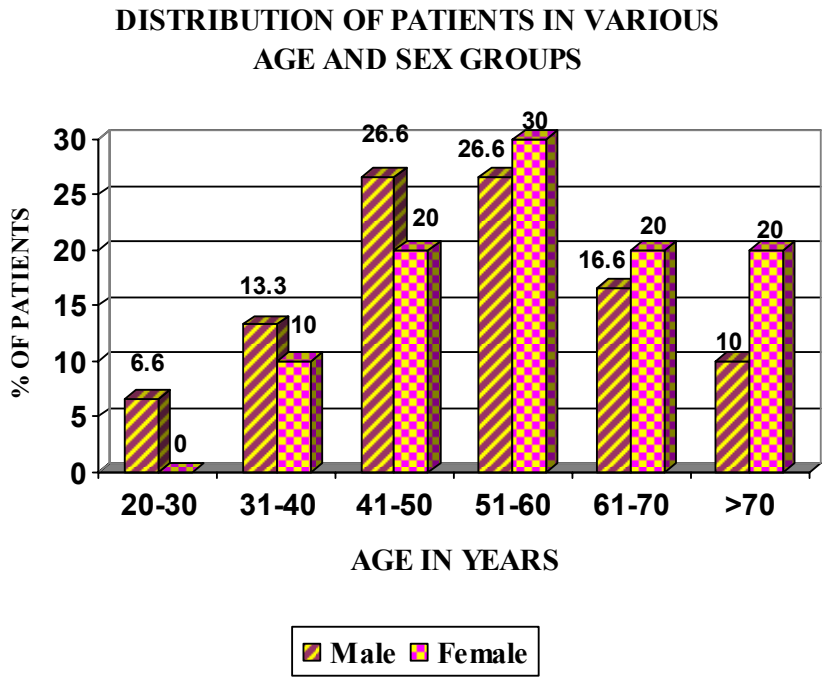


Fig.3 – The Peak incidence of Oral cavity cancer for males were between 40-60 yrs and for females 50 to 60 yrs

SOCIO ECONOMIC STATUS WISE INCIDENCE

OF ORAL CANCER

GROUPS	SOCIO ECONOMIC STATUS	NUMBER OF PATIENTS	%
1.	Low	27	67.5
2.	Moderate	13	32.5
3.	High	_	_

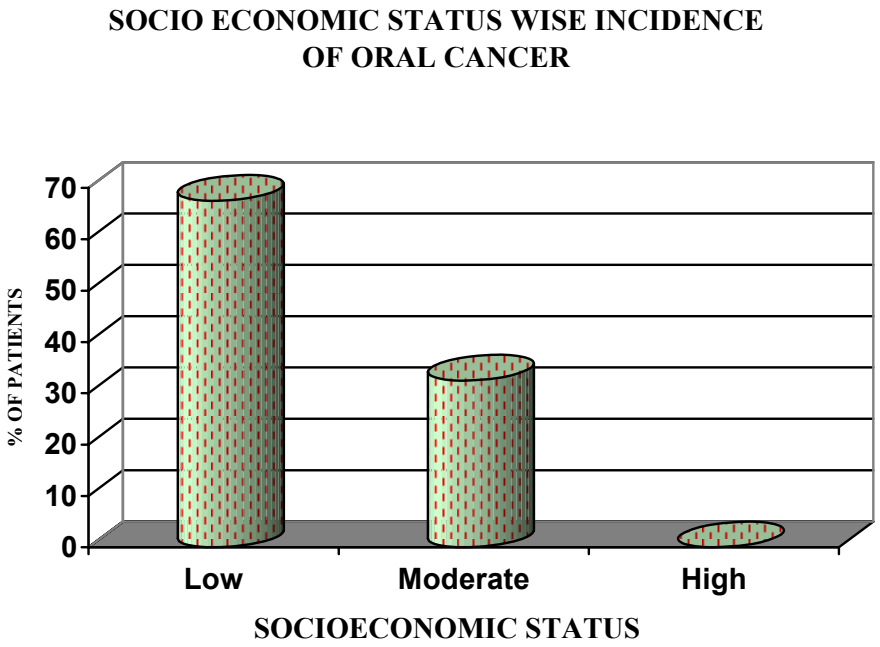


Fig.4 – Oral Cancer was commonly found in low socioeconomic status

PREDISPOSING FACTORS

SI.NO	FACTORS	TOTAL NO	%
1	Chewing Tobacco	16	40
2	Smoking	16	40
3	Alcoholism	13	32.5
4	Dental Caries & Dental Lesions	20	50
5	Nutritional Deficiency	25	62.5
6	None	2	5

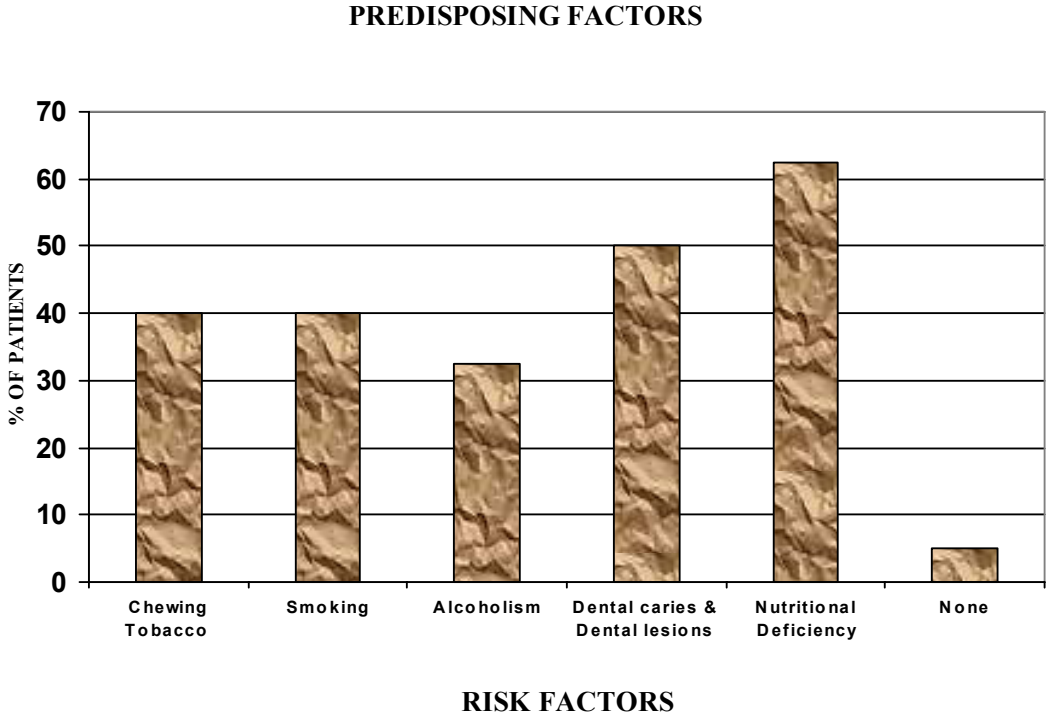


Fig.5 – Nutrional deficiency associated with chewing Tobacco was the most Common risk factor for the oral cavity cancer

PREMALIGNANT LESIONS

SI.NO	LESIONS	TOTAL NO	%
1	Leukoplakia	11	27.5
2	Submucosal Fibrosis	11	27.5
3	Erythroplakia	2	5
4	Leukoerythroplakia	1	2.5
5	None	18	45

PREMALIGNANT LESIONS

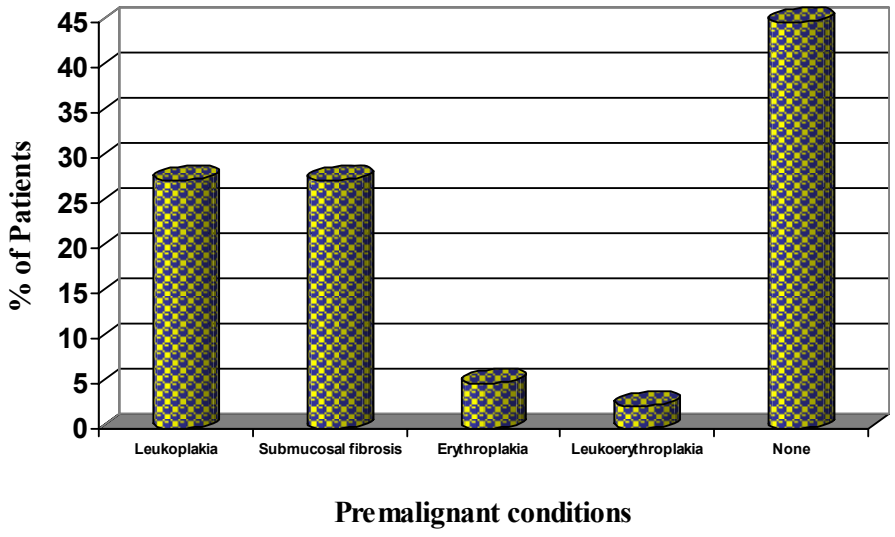


Fig.6 – Most of the patients 45 % had no premalignant lesions and leukoplakia and submucosal fibrosis were the most common premalignant lesions encountered

DISTRIBUTION OF PATIENTS ACCORDING TO HISTOPATHOLOGICAL TYPES

SI.NO	TYPE	TOTAL NO	%
1	Well differentiated	21	52.5
2	Moderately differentiated	17	42.5
3	Poorly differentiated	2	5

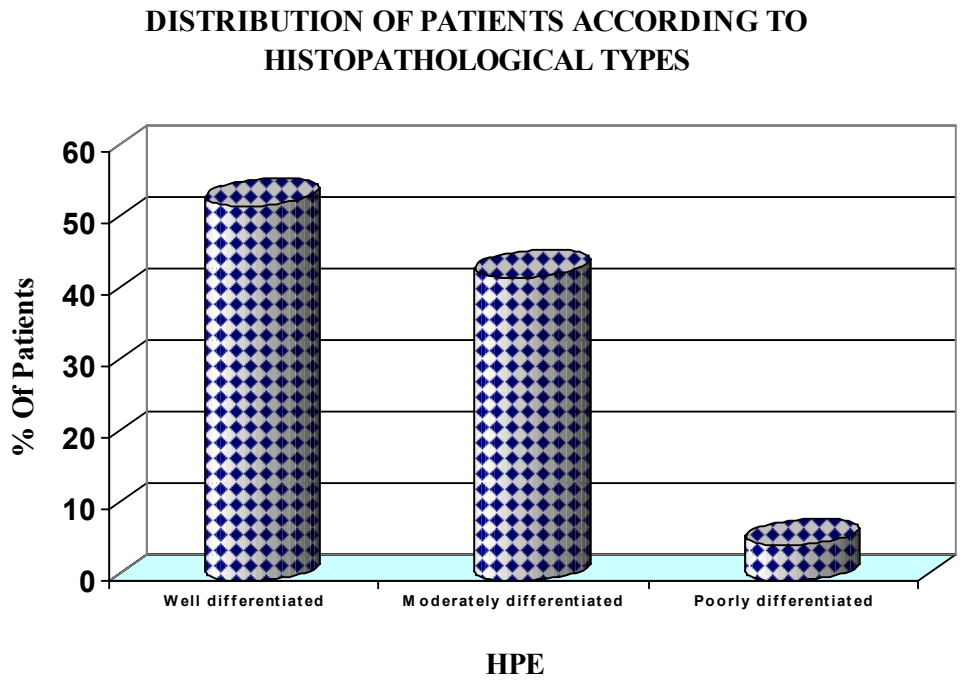


Fig.7 – All the lesions were squamous cell carcinoma out of that well differentiated squamous cell carcinoma was the most common Histopathological sub type

DISTRIBUTION OF PATIENTS ACCORDING

TO LESION

SI.NO	LESIONS	No. OF PATIENTS	%
1	< 2 CM	22	55
2	2 – 4 CM	8	20
3	> 4 CM	3	7.5
4	Adjacent Structure involved	7	17.5

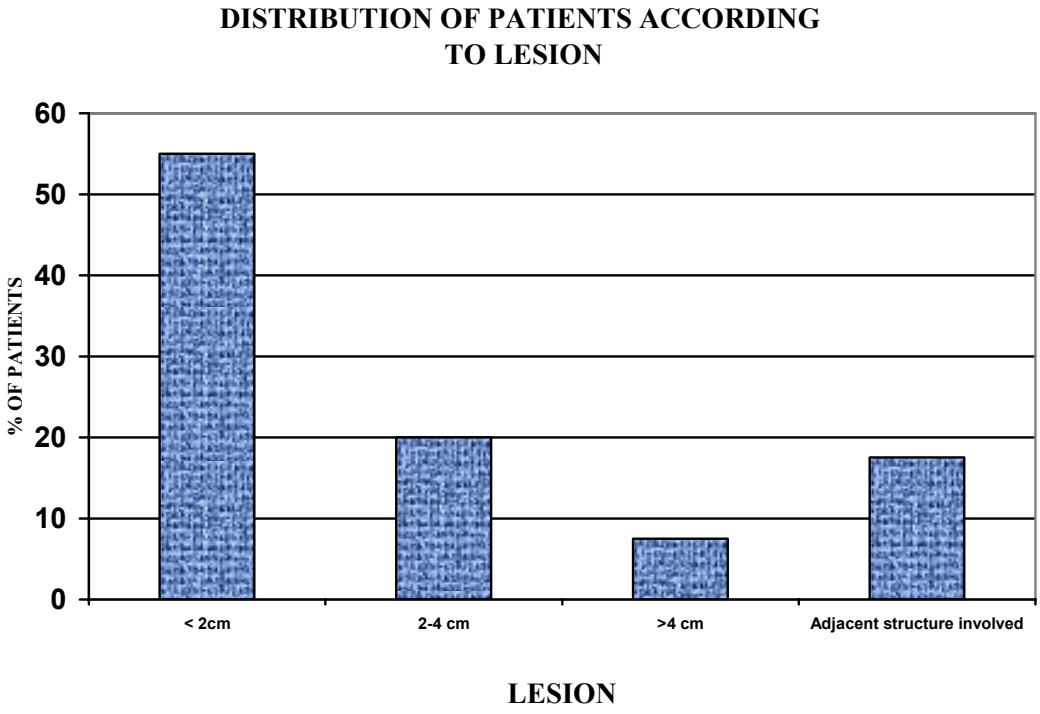


Fig.8 – 55% of patients were T1 lesions and next

Commonest were T2 lesions (2- 4 cm)

STAGE GROUPING OF THE STUDY

SI.NO	STAGE	SITE			TOTAL	%
		CHEEK	LIPS	ALVEOLUS		
1	I	14	8	_	22	55
2	II	3	3	_	6	15
3	III	3	2	_	5	12.5
4	IV	6	_	1	7	17.5

STAGE GROUPING OF THE STUDY

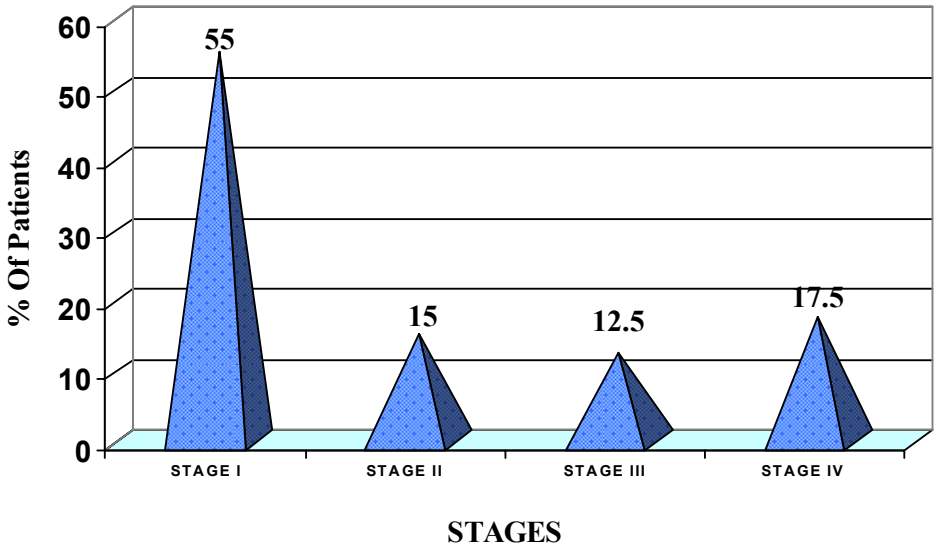


Fig.9 Most of the patients were in Stage I disease in both lip and cheek Carcinoma and next commonest were stage IV disease

MODES OF TREATMENT

SI.NO	SITE	RADICAL EXCISION ALONE	RADICAL EXCISION + MANDIBULECTOMY	RADICAL EXCISION + NECK DISSECTION	RADICAL EXCISION + MANDIBULECTOMY + NECK DISSECTION	POST OP RADIO THERAPY
1	Cheek	17 (65.3%)	3 (11.5 %)	3 (11.5 %)	3 (11.5 %)	6 (23%)
2	Lips	11 (84.6%)	–	2 (15.4%)	–	2 (15.4%)
3	Alveolus	–	–	–	1	1

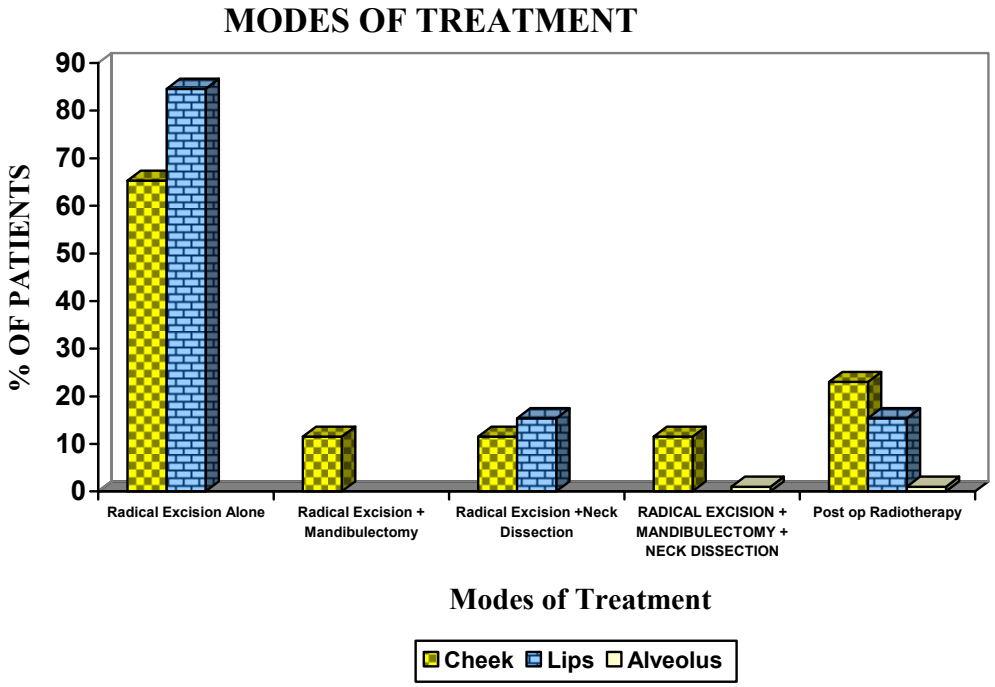


Fig.10 In cheek carcinoma & Lip carcinoma since most of the patients were in stage I disease, Radical Excision alone was done

TYPES OF MANDIBULECTOMY

SI.No	Type	No
1	Marginal	4
2	Segmental	2
3	Hemimandibulectomy	1

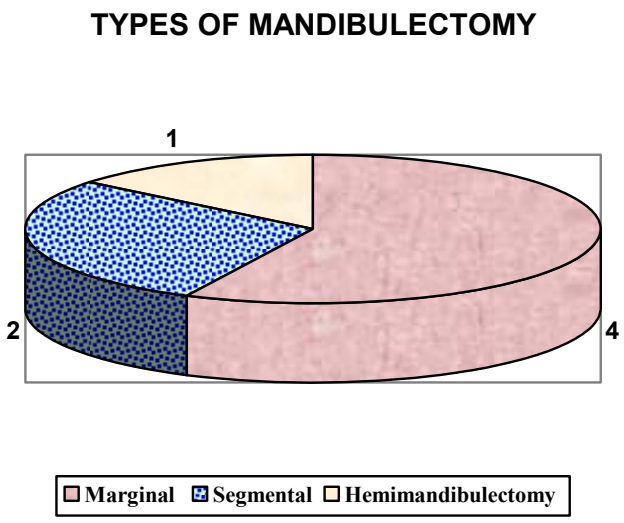


Fig.11 Most of the patient had undergone marginal mandibulectomy and only one patient had Hemimandibulectomy

METHODS OF RECONSTRUCTION

SI.NO	SITE	MODES			Distant	FREE
		LOCAL		REGIONAL		
		PRIMARY CLOSURE	FLAP			
1	Cheek	0	0	16 (61.5%)	9 (34.6%)	1 (3.8%)
2	Lip	5 (38.5%)	8 (61.5%)	0	0	0
3	Alveolus	-	-	-	1	-

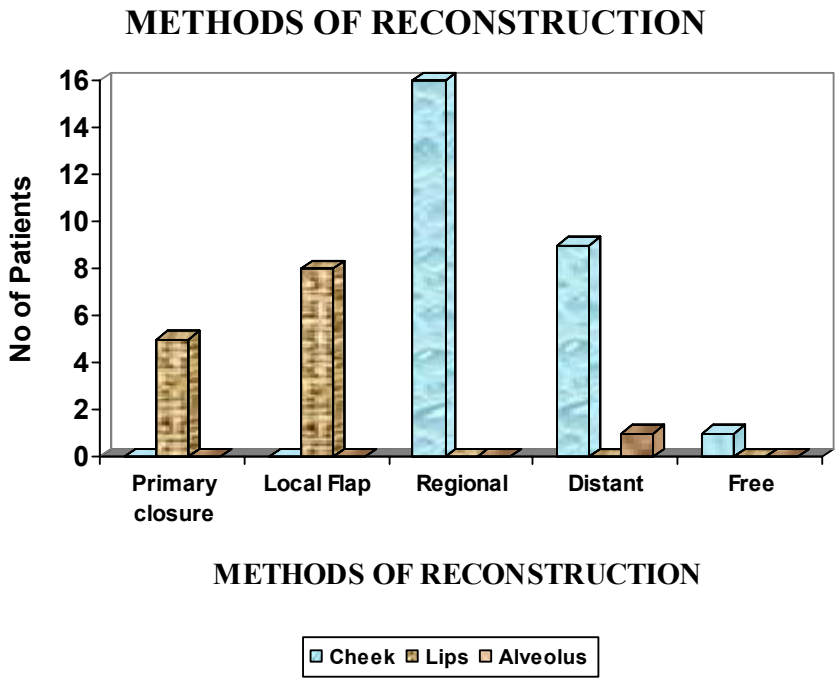


Fig.12 In carcinoma cheek most of the lesions were stage I and hence managed with regional flaps and 9 patients were reconstructed with distant flaps

FLAP OPTIONS

SI.NO		OPTIONS	NO
1	C H E E K	Forehead flap for both lining & Cover	16
2		Pectoralis major myocutaneous flap for lining & fore head for cover	3
3		Bipaddle PMMC	2
4		PMMC Flap for lining & DP for cover	2
5		PMOMC flap for both lining and cover	2
6		Free radial fore arm flap for both lining and cover	1
7	ALVEOLUS	Free rib graft with PMMC for lining & forehead for cover	1
8	L I P	Excision & primary closure	5
9		Gillies fan flap	6
10		Karapandzic	1
11		Schuchardt	1

STAGE WISE RECONSTRUCTIVE OPTIONS

CARCINOMA CHEEK

SI.NO	STAGE	LOCAL	REGIONAL	DISTANT	FREE
1	I	-	12	1	1
2	II	-	-	3	-
3	III	-	2	1	-
4	IV	-	2	4	-

LIP CARCINOMA

SI.NO	STAGE	PRIMARY CLOSURE	LOCAL FLAPS
1	I	5	3
2	II	-	3
3	III	-	2
4	IV	-	-

Alveolus carcinoma (stage IV) managed with distant flaps

COMPLICATIONS

SI.NO	COMPLICATION	TOTAL NO.	%
1	Infection	5	12.5
2	Fistula	3	7.5
3	Necrosis	2	5
4	Dehiscence	2	5
5	None	30	75

COMPLICATIONS

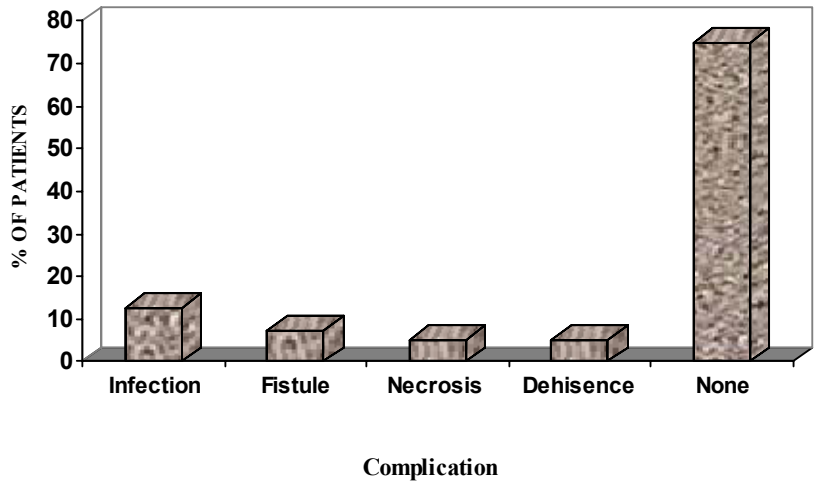


Fig 13: 75% had no significant complications remaining has infection, Fistula, Flap necrosis and dehiscence

DISCUSSION

In our institution oral cavity cancer 12.2 % constitute the second most common cancer next to breast. According to national cancer registry program ICMR survey shows that oral cavity cancer occupies the most common carcinoma in male and third most common carcinoma in females.

This corroborates with the statistics from cancer institute (WIA) [38] and Jipmer.

In our study 65% of patients were carcinoma cheek, 32.5% were carcinoma lip and 2.5 % were carcinoma alveolus as seen in Aringnar Anna cancer institute -kanchipuram.

In our study the peak incidence of oral cavity cancer is between 50-60 years.

National cancer institute (SEER) program USA has identified that more than 50% of oral cavity malignancy occurs above the age of 60 years.

Male: female ratio in our study is 3:1 which is in accordance with national cancer registry USA and other published literature.

67.5% of patients belong to low socio economic strata and this could be attributed to various factors like poor nutritional status, bad oral hygiene and lack of health awareness.

62.5% of patients had nutritional deficiency which corroborates with the low socioeconomic status of the patients involved in our study followed by poor dental hygiene in 50% of patients, tobacco chewing and smoking in 40 % patients.

The role of poor nutrition in oral cancer is a significant factor B complex deficiency, siderophenia have been absorbed in oral cavity cancer patients.

In our study almost 62.5% of our patients had signs of poor nutrition.

Submucous fibrosis and leukoplakia were the commonest premalignant lesions seen in our study.

Pindborg etal[32] suggested approximately 6% of all leukoplakia become malignant.

In our study 55% of patients were in stage I, 15% were in stage II 12.5% were in stage III, and 17.5% were in stage IV

Our study excluded all patients with distant metastasis and lesions involving the retromolar trigone.

In our study 84.6% of patients with lip carcinoma underwent radical excision, 15.4% underwent radical excision with modified radical neck dissection and these patients also required post op radio therapy.

Of these 5 patients had their post excision defect closed primarily and the rest of 8 patients required local flaps for coverage of the defect.

6 patients were reconstructed using Gillies fan flap and 1 patient required Karapandzic and another patient required Schuchardt procedure.

Of the 6 patients who underwent Gillies fan flap 1 patient suffered from marginal rim necrosis and flap dehiscence and 1 patient suffered from fistula which was managed conservatively.

5 patients of stage I carcinoma lip underwent excision and primary closure.

3 stage I patients needed a local flap for reconstruction and 3 patients with stage II and 2 patients with stage III were required local flaps.

We were never encountered with a situation in which a case of carcinoma lip required a distant pedical flaps.

The local flaps were versatile and ideal for reconstruction of defects ranging from commissure to central lip defects and it is durable.

The best aesthetic outcomes were seen in patients who underwent primary closure of the defect, the functional outcome was good in all but one patient who developed a fistula but it is was resolved spontaneously.

There was no difference in functional and aesthetic outcome between the one patient who underwent Karpandzic and the rest who had a Gillies fan flap but this is not a statistical difference as the numbers are very small.

These findings are in accordance with Rajan etal[34] views in which he concluded that the fan flap are safe and reliable flaps for the lip reconstruction in terms of form and function. He reported microstomia as the most significant problem in these series of patients.

2 of our patients who underwent bilateral fan flap procedure had microstomia but patients had little functional disability due to this problem.

Of the 26 patients who had carcinoma cheek 14 patients had stage I disease, 3 patients had stage II disease, 3 patients had stage III disease and 6 patients had stage IV disease.

65.3% underwent radical excision alone, 11.5% required mandibulectomy in addition to radical excision, another 11.5% of patients underwent nodal clearance in addition to radical excision and 11.5% patients required both mandibulectomy and nodal clearance in addition to radical excision.

6 patients had post op radiotherapy (23%)

1 patient had carcinoma alveolus and he underwent radical excision with mandibulectomy with nodal clearance and he also had post op radiotherapy.

Of the patients who underwent mandibulectomy, 4 patients had marginal mandibulectomy 2 patients had segmental mandibulectomy and 1 patient underwent hemimandibulectomy.

In patients who underwent segmental mandibulectomy the 2 patients reconstructed with pectoralis major osseomyocutaneous flap and 1 patient who had hemimandibulectomy was reconstructed with free rib graft with pectoralis major myocutaneous flap for lining and forehead flap for cover.

Of the 26 patients who had carcinoma cheek and 1 patient with carcinoma alveolus, 16 patients were reconstructed with using regional flaps and 10 patients were reconstructed with distant pedicled flaps.

1 patient reconstructed with free flap.

In patients who had carcinoma cheek 16 patients were reconstructed with folded forehead flap for both lining and cover.

3 patients were reconstructed with pectoralis major myocutaneous flap for lining and forehead flap for cover.

2 patients were reconstructed with bipaddle pectoralis major myocutaneous flap.

2 patients required pectoralis major myocutaneous flap for lining and deltopectoral for cover.

2 patients underwent pectoralis major osseo myocutaneousflap for both lining and cover.

1 patient underwent free radial forearem for both lining and cover.

12 patients with stage I carcinoma cheek needed regional flaps for reconstruction.

1 patient required distant flap and other required a free flap.

All 3 patients with stage II needed a distant flap.

In 2 patients with stage III disease were reconstructed with regional flaps and 1 patient with stage III needed a distant flap.

Of stage IV patients 4 patients required a regional flap and 2 patients required distant flap.

Of the 2 patients who underwent pectoralis major osseomyocutaneous flap 1 had salivary fistula and other had partial necrosis with infection.

2 more patients who underwent pectoralis major myocutaneous for lining had minor complications like wound infection.

Only 2 patients who underwent forehead flap had complications.

In our study folded forehead flap was the work horse flap for the reconstruction of the full thickness defects of the cheek with the complication rate of 12.5%.

No patients had microstomia, 2 patients had drooling of saliva due to loss of competence at the lip commissure.

None of the forehead flaps failed with the only one patient had partial necrosis.

Forehead flap are proven to be versatile, highly reliable flap for the reconstruction of full thickness cheek defect.

Shah JP[37] Findings are in accordance with our study experience and he states that folded forehead flap appear to be a reliable and quick way of obtaining both cover and lining for reconstruction of through and through defect of the cheek.

Kelly JM[23] states that forehead flap is very durable and reliable and can be used for reconstruction of massive defects which we also agree as 2 patients with stage IV and 2 patients with stage III disease were reconstructed using forehead flap alone for lining and cover.

Mclean JN etal[25] states that pectoralis major myocutaneous flap is very versatile with proven reliability for soft tissue coverage of many head and neck defects with 99.2% of survival rate which is in accordance with our findings.

Chiummariello etal[9] states that pectoralis major myocutaneous flap is valid alternate to free tissue transfer because of reduced operation time, reduced anesthetic risk, reduced risk of total flap necrosis and decreased cost. Hence it could be consider as a preferable choice in selective cases.

Our centre with limited micro vascular experience and infra structure pectoralis major myocutaneous flap had proven to be mainstay of reconstructing the massive defects.

2 osseomyocutaneous pectoralis major flap had a significant complication which is in accordance with Robertson etal[35] findings who suggest that the osseo myocutaneous pectoralis flap with sternum as an osseous compenent is more reliable than the pectoralis with rib as osseous component.

1 patient with stage I disease of carcinoma cheek was reconstructed with radial forearm free flap and this was the first case of free microvascular transfer in our department. This patient had excellent functional and esthetic outcome with no complication.

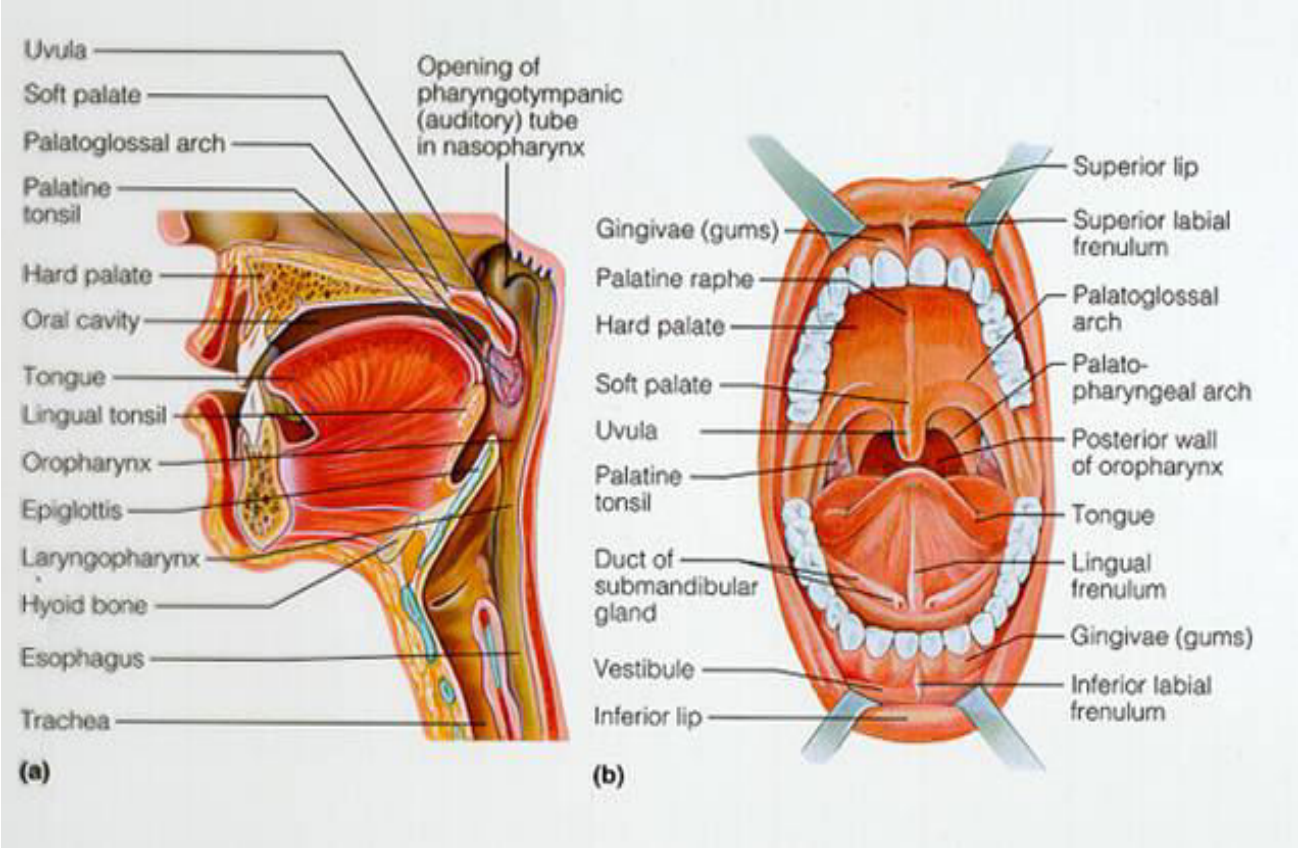
Savant etal[36] and Rajacic etal[29] concludes that single stage reconstruction of full thickness defect of the cheek with folded free radial forearm flap is reliable and produces excellent cosmesis with minimal donor site morbidity which is in accordance with our study and free radial forearm flap is valid reconstructive option even in centres with limited microvascular experience due to its ease of elevation and excellent flap quality and relatively large diameter pedicle.

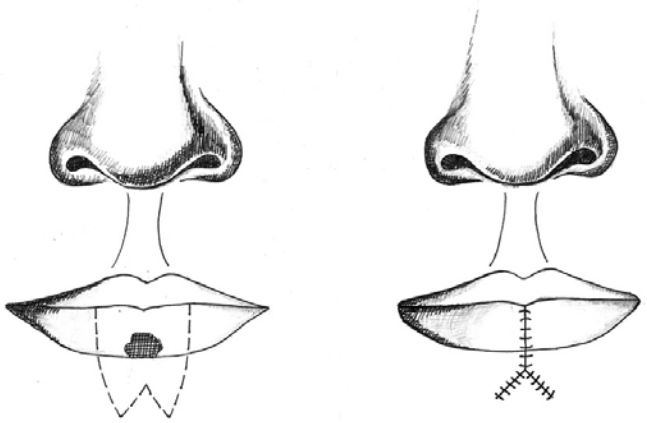
CONCLUSION

- Oral cancer is a national problem.
- It remains the challenge as a surgery forms the mainstay of treatment but the reconstruction of post excisional defect as the post excisional defect are complex wound which often requires replacement of lining, skin cover and bone.
- With the multimodality management emerging as the treatment of choice, the reconstructive surgeon has to be the part of a team which includes oncosurgeon, radio therapist and oncopathologist.
- Commonest age group affected were 50 – 60 years, because of easy accessibility of lesion, a rigorous screening program in these age groups especially those who are at high risk will enable early detection of lesion which would provide better curative and easier reconstructive options.
- Tobacco in any form is the major predisposing factor, health education through mass media and posters in health centers in a large scale by Government and Non- Government organizations will create awareness and help in prevention.

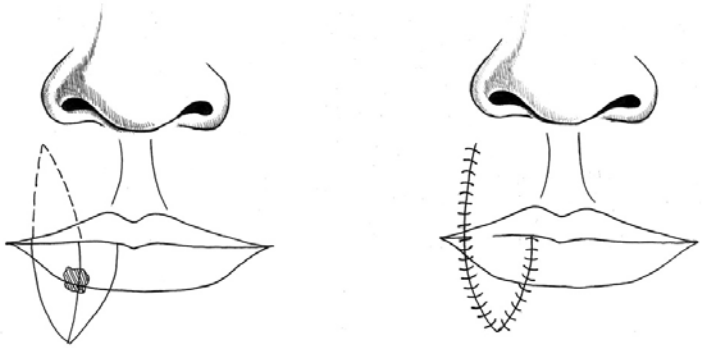
- The site, size , adjacent structures involved and comorbid conditions are the three major factors which influence the choice of reconstructive options.
- Gillies fan flap has proven to be most versatile and reliable flap for coverage of both upper and lower lip full thickness defects.
- The folded forehead flap is the mainstay of the reconstruction of the full thickness cheek defects including massive defects.
- For large defects pectoralis major myocutaneous flap either singly or in addition to forehead or delto pectoral flap has been the main reconstructive option with good reliability and acceptable complications.
- With the advent of microvascular surgery, the radial forearm free flap is the valid alternative when the above mention pedicled flap either inadequate, unavailable and in patients without co morbid conditions.
- The main limiting factor for microvascular tissue transfer is availability of infra structure and expertise.

ANATOMY OF ORAL CAVITY

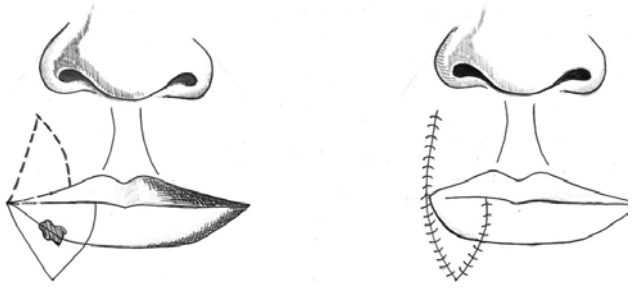




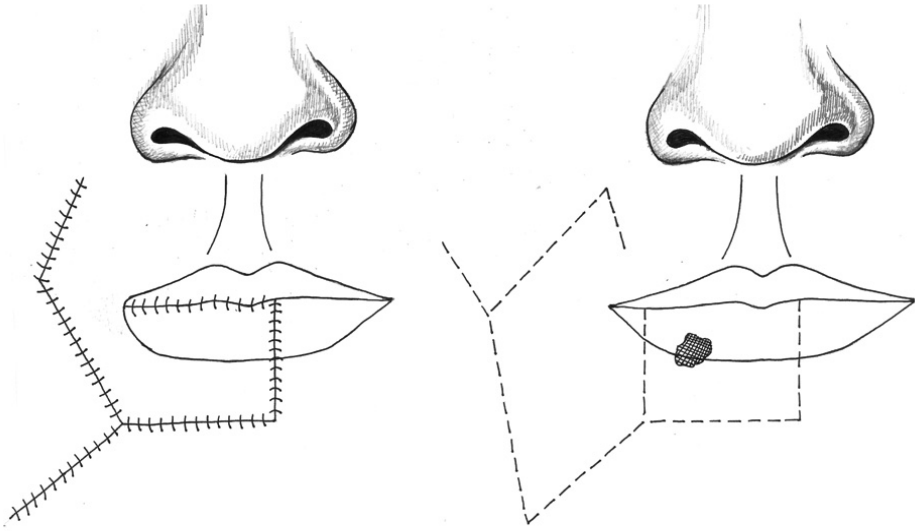
Wedge Excision and Primary Closure



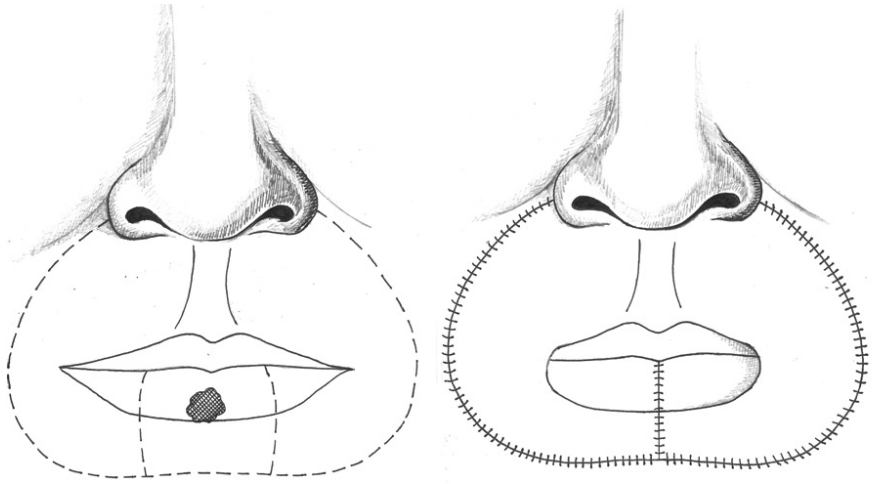
Abbé Flap



Estlander Flap

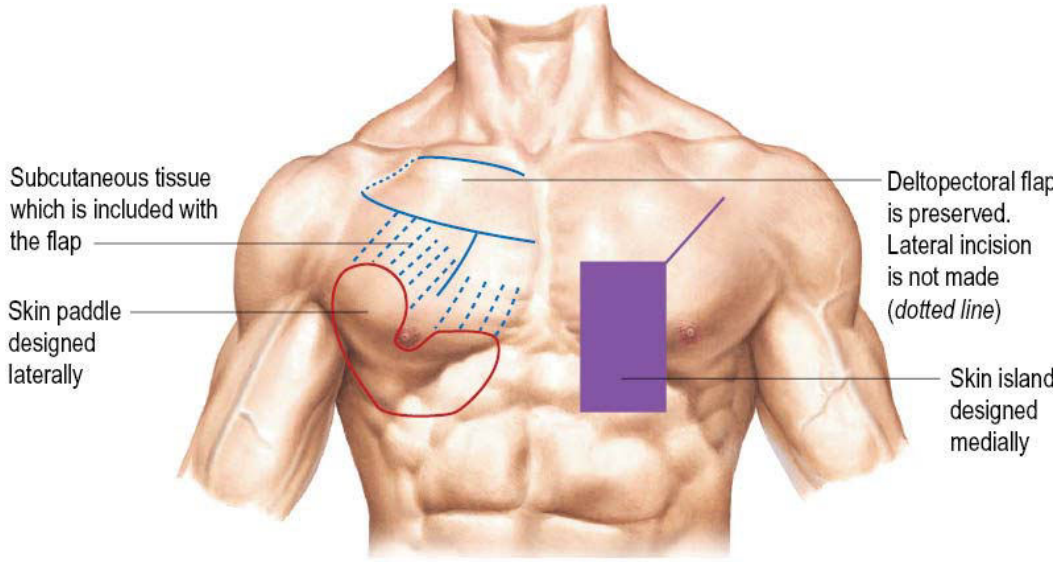


Gillies Fan Flap

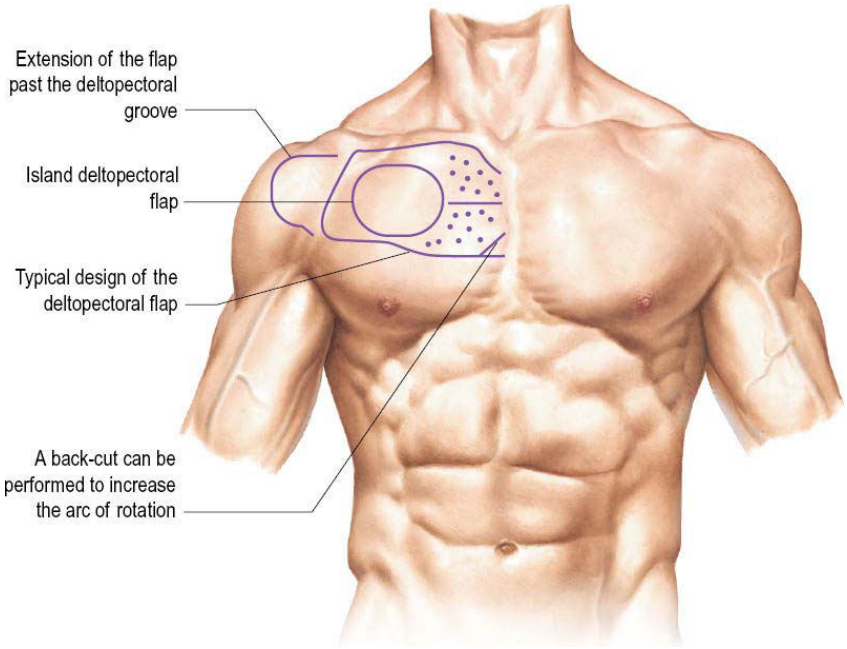


Karapandzic Flap

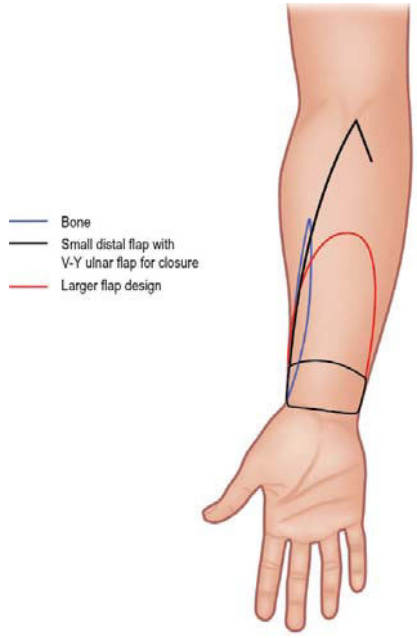
PECTORALIS MAJOR MYOCUTANEOUS FLAP DESIGN



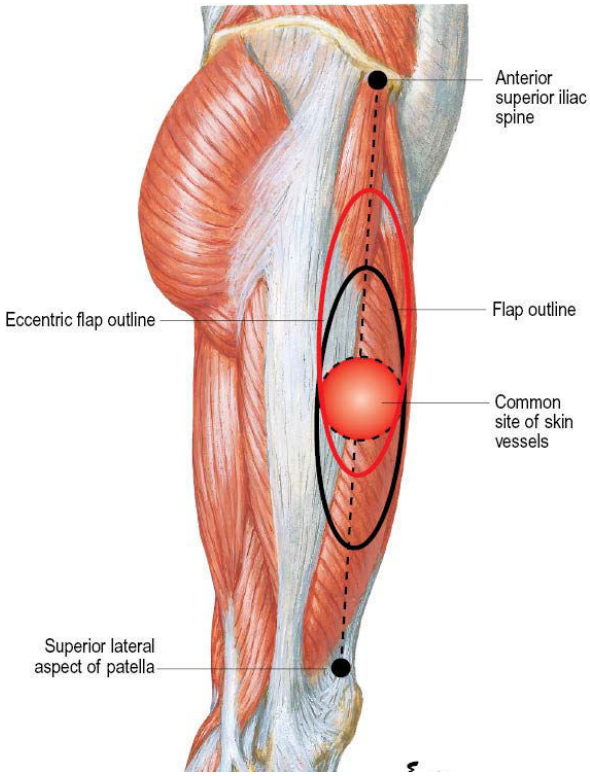
DELTO PECTORAL FLAP DESIGN



RADIAL FOREARM FLAP DESIGN



ALT FLAP DESIGN



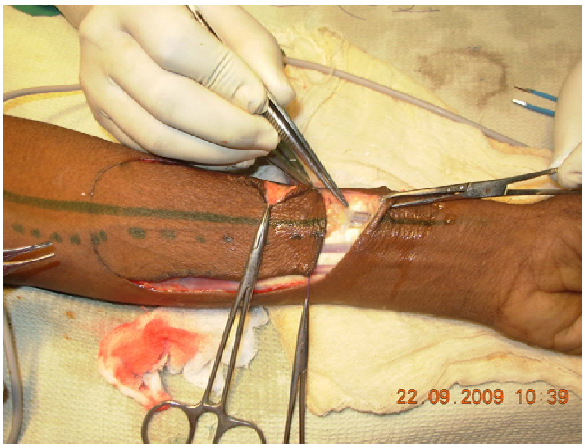
FREE RADIAL FOREARM FLAP

RECIPIENT VESSEL DISSECTION

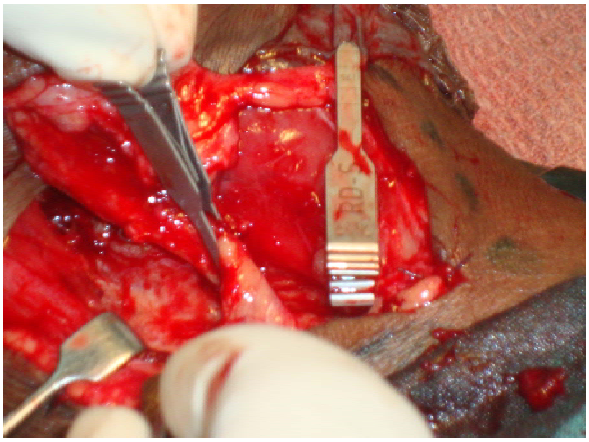
RESECTION

POST EXCISIONAL DEFECT

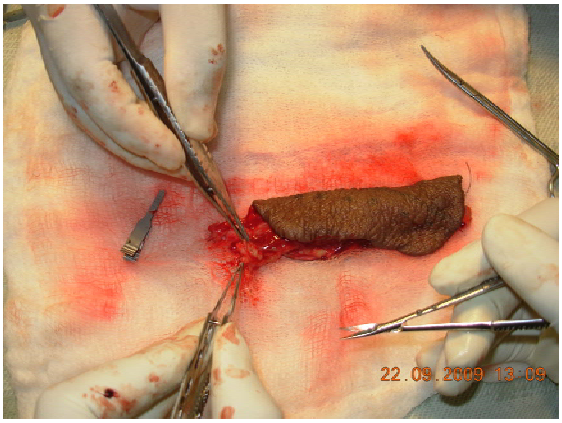
FLAP ELEVATION



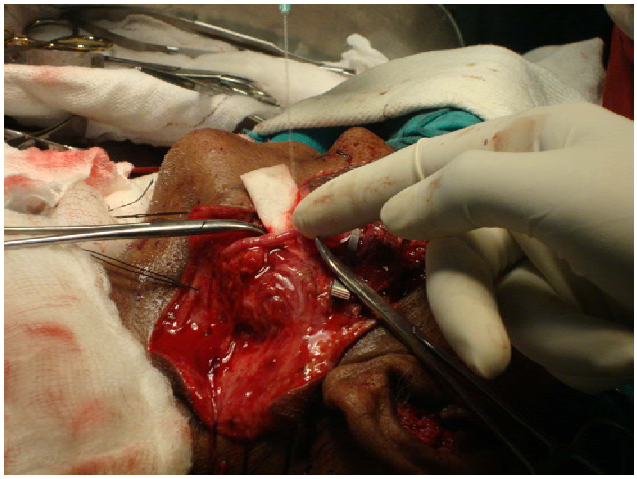
DONOR VESSEL DISSECTION



PEDICLE PREPARATION



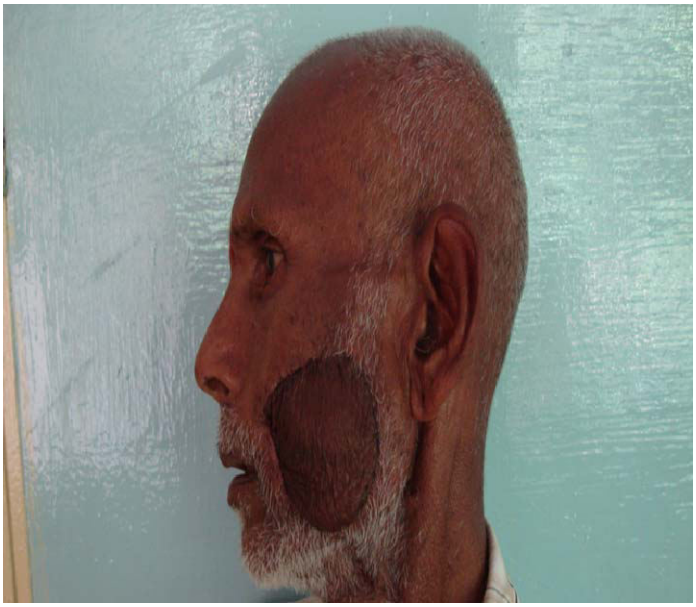
ANASTOMOSIS



FLAP INSET

IMMEDIATE POST OP

TWO MONTHS POST OP



PMMC FOR LININIG AND FORE HEAD FLAP FOR COVER

PRE OP

FLAP MARKING

WIDE EXCISION AND NECK DISSECTION

FLAP INSET

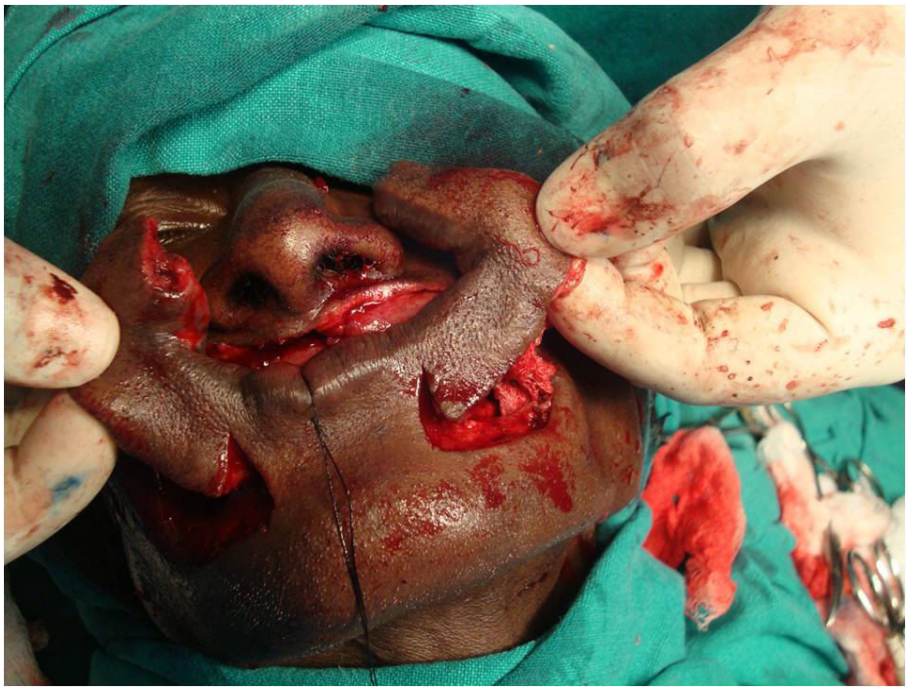
POST OP

BILATERAL GILLIES FAN FLAP

PRE OP

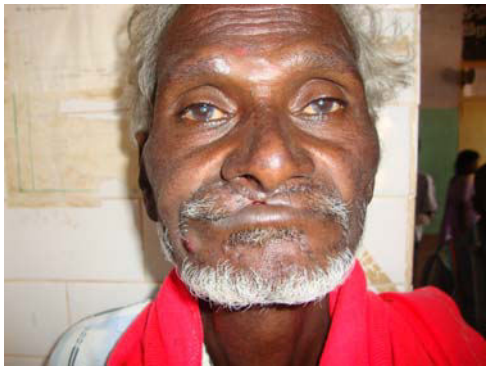
WIDE EXCISION AND FLAP MARKING

FLAP ELEVATION



FLAP INSET

POST OP



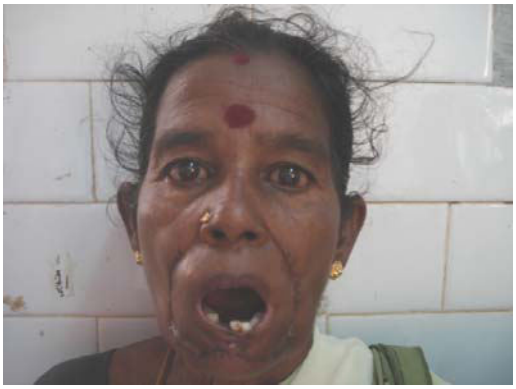
KARAPANDZIC FLAP

FLAP MARKING

POST OP

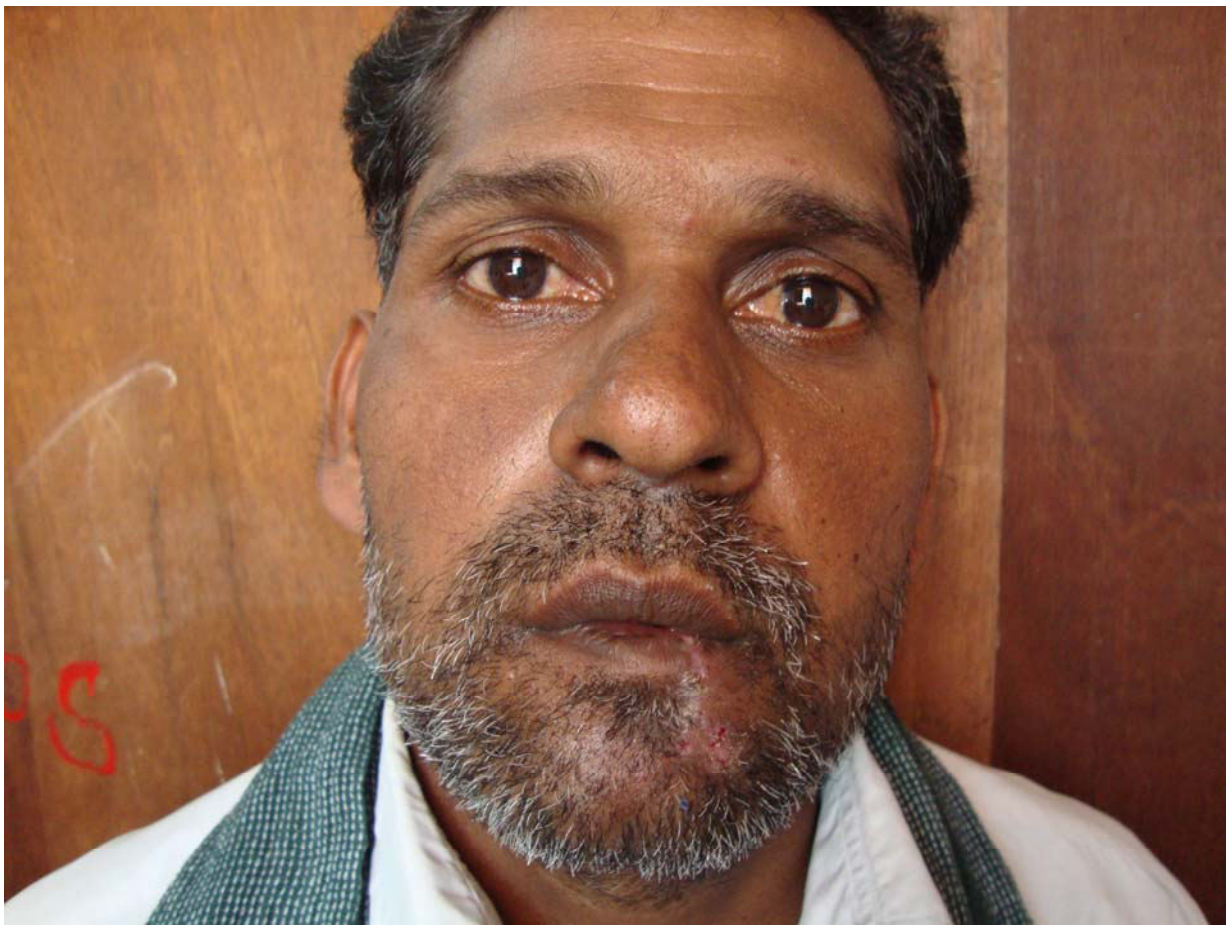
IMMEDIATE

LATE

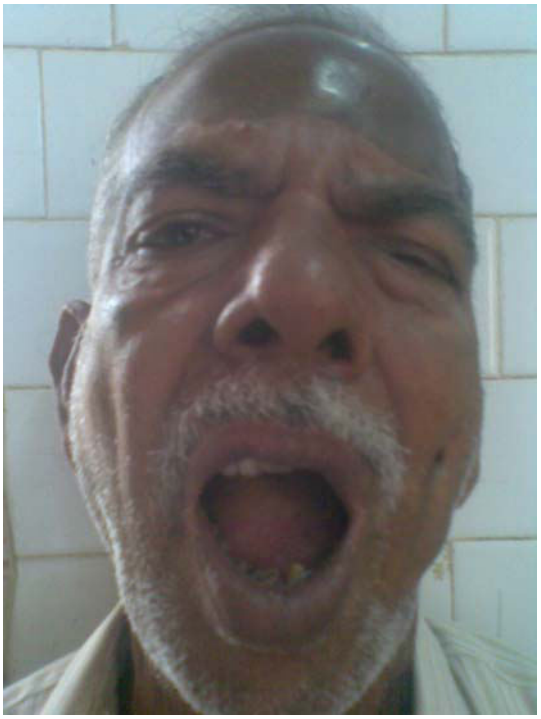


DELTO PECTORAL FLAP FOR COVER

EXCISION AND PRIMARY CLOSURE



FOLDED FOREHEAD FLAP – LONGTERM FOLLOWUP



UNILATERAL GILLIES FAN FLAP

PRE OP

POST OP

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Key to the Master Chart

1. Sex: M-Male, F- Female
2. Socioeconomic status: 1- Poor, 2- Moderate
3. Risk factors: 1- Yes, 2- No
4. Symptoms : 1- yes , 2- No
5. Site : 1- Yes, 2. No
6. Premalignant lesions: 1- Leukoplakia, 2-erythroplakia, 3- leukoerythroplakia, 4-Candidiasis, 5- Submucous fibrosis
7. Type of growth: 1- Exophytic, 2- Endophytic
8. Tumour: 1- T1, 2- T2, 3- T3, 4- T4 lesions
9. Histopathological Examination: 1- Squamous Cell Carcinoma
10. Grade: 1- Well differentiated, 2- Moderately differentiated, 3- Poorly differentiated.
11. Surgery: 1- Excision and Closure and 2- Excision and Reconstruction
12. Mandibulectomy: 0- No, 1- Marginal Mandibulectomy, 2- Segmental Mandibulectomy 3- Hemi Mandibulectomy
13. Nodal clearance: 0-No, 1- Modified radical neck dissection.
14. Reconstruction: 0- Primary closure,1- Gillies Fan Flap,2-Karapandzic Flap,3-Schuchdart 4- Folded Forehead Flap for both lining and cover, 5- Pectoralis major myocutaneous flap for lining and Fore head flap for cover 6-Bipaddle Pectoralis major myocutaneous flap, 7- Pectoralis major myocutaneous flap for lining and Delto pectoral flap for cover, 8- Free Radial Forearm Flap, 9- Pectoralis major osseomyocutaneous Flap for both lining and cover,10- FreeRib Graft with pectoralis major for lining and forehead for cover.
15. Radiotherapy: 0- No, 1- Yes.
16. Chemotherapy: 0- No
17. Complications: 1- Fistula, 2- Necrosis, 3-Infection, 4-Flap dehiscence

PROFORMA – ORAL CAVITY MALIGNANCY

Name : Age : Sex :

IP.No. / OPNO : Occupation :

CHIEF COMPLAINTS

1. Swelling ☐
2. Ulcer ☐
3. Pain ☐
4. Excessive salivation ☐
5. Fever ☐
6. Fetor ☐
7. Lump in neck ☐
8. Change in Voice ☐
9. Dysphagia ☐
10. Difficulty in Chewing ☐
11. Ankyloglossia ☐
12. Inability to articulate (Dysarthria) ☐
13. Trismus ☐
14. Retromolar Extension ☐

COMORBID CONDITION – Yes/No

RISK FACTORS (HABITS)

1. Cigarette Smoking ☐
2. Tobacco Chewing ☐
3. Betel nut Chewing ☐
4. Alcohol Consumption ☐
5. Snuff ☐
6. Panmasala ☐
7. Dental caries / lesions ☐

PHYSICAL EXAMINATION

General examination - Build

- Nourishment

- Anaemia

LOCAL EXAMINATION

Primary Site of Tumor

Lip ☐

Anterior 2/3 tongues ☐

Floor of mouth ☐

Buccal mucosa ☐

Upper alveolar ridge ☐

Lower alveolar ridge ☐

Retromolar trigone ☐

Pre Malignant Conditions

Leukoplakia ☐

Erythroplakia ☐

Combined erythro and Leukoplakia ☐

Submucosal fibrosis ☐

Candidiasis ☐

No specific lesion ☐

TYPE OF GROWTH

Exophytic ☐

Endophytic ☐

Invasion of Skin ☐

Invasion of Bone ☐

TNM

T T_x T_o T_1 T_2 T_3 T_4

N N_x N_o N_1 N_{2a} N_{2b} N_{2c} N_3

M M_x M_o M_1

CLINICAL STAGING

I

II

III

IV

INVESTIGATION FOR DIAGNOSIS

Histopathological Examination		**Grade**	
Squamous Cell Carcinoma	☐	Well Differentiated	☐
Squamous Cell Carcinoma and Variants	☐	Moderately differentiated	☐
Adeno Carcinoma	☐	Poorly differentiated	☐
Adeno Carcinoma and variants	☐		

FOR STAGING

X-ray mandible / CT Facial Bone / OPG (Orthopantomogram)

X-ray PNS / X-ray Chest

USG Abdomen

For Assessment

1) Urine – albumin and sugar
2) Blood Hb%
3) Blood Urea, Blood sugar, Serum creatinine & Serum Electrolytes.
4) Liver function test
5) Clotting time / Bleeding time.
6) Complete haemogram
7) ECG in all chest test

TREATMENT PLAN

RADIOTHERAPY Primary RT - External beam radiotherapy ☐

- Brachytherapy ☐

Adjuvant RT - External beam radiotherapy ☐

- Brachytherapy ☐

SURGERY

Wide excision ☐

Wide excision + Neck Dissection ☐

Wide excision + Mandibulectomy ☐

Wide excision + Neck Dissection + Mandibulectomy ☐

RECONSTRUCTION

Cover :

Lining :

Bone :

COMPLICATION

- Wound infection ☐ Other ☐
- Fistula formation ☐
- Flap necrosis ☐
- Flap dehiscence ☐

FOLLOW UP